MODEL AIRPLANE NEWS

BONUS! KIT BUYERS' GUIDE

48120

THE WORLD'S PREMIER R/C MODELING MAGAZINE

March 1995

MADERA

UNLIMITED RACES!

SEE PAGE 28

HOW TO

MAKE FIBER-GLASS COWLS

BUILD GIANT-SCALE SKIS

PERFORM A KNIFE-EDGE LOOP

MOUNT ELECTRIC MOTORS

TEC ASH 5 RADIO— W PRICE AND ROGRAMMABLE!

IANT BYRON T-6 TEXAN

FLIGHT TESTED

- THUNDER TIGER VINDSTAR SAILPLANE
- ALTECH'S HUGE BEECH MUSKETEER

ELECTRIC JET AIRLINER —FLIES ON FOUR 05 MOTORS!

USA $3.50 CANADA $4.50

03>

UPC 0 09128 48120 3

MARCH 1995 VOLUME 123, NUMBER 3

MODEL AIRPLANE NEWS

FEATURES

ABOVE: *determination is the password for Robert Heitkamp and crew. While at home, this Alaska-based competitor is forced to fly off a beach to practice—while standing in the water! Photo by Rob Wood.*

ON THE COVER: *the crew of the Classical Racing Team work on the Paul Steiner Cosmic Wind. The 31-pound plane was flown by Bryan Keil, and it won first place in the Formula One Gold category. Photo by Rob Wood.*

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.,** 251 Danbury Rd., Wilton, CT 06897. Second-class postage paid at Wilton, CT, and at additional mailing offices. Subscription rates: $27.95 for 1 year (Canada, $43.82—includes G.S.T.; foreign, $40.95); $49.95 for 2 years (Canada, $81.27—includes G.S.T.; foreign, $75.95). **Postmaster:** send Form 3579 to **Model Airplane News,** P.O. Box 428, Mount Morris, IL 61054.

EDITORIAL

FRANK MASI

ELECTRICS ADVANCE

Model Airplane News "Simple Programming" columnist and test pilot Dave Baron prepares to fly the Aura III, imported by Slegers International. The kit, which will be reviewed in an upcoming issue, is representative of the trend toward very high-performance, prebuilt, electric aircraft (note the Aveox brushless motor). Photo by Walter Sidas.

While talking with a major European kit manufacturer at a recent trade show, we learned that electric-powered R/C airplanes account for approximately 50 percent of the product sold in some European markets. Commentators have also reported on the clear trend there toward almost-ready-to-fly kits. To be sure, the need to preserve flying fields (quiet, electric propulsion can help) and the premium on time are influencing the hobby both here and abroad. The rising availability of prebuilt composite electrics is partly an offshoot of these trends, although these new kits also owe much to advances in sailplane fabrication and to new and improved electric motors. Is the time of explosive growth in electrics in this country nearly upon us? Some have predicted this for years, but we must continue to wait and see.

A noteworthy advance in the organization of electric fliers—one that could help catalyze the growth of this segment—has just taken place with the formation of the National Electric Aircraft Council (NEAC)—a special-interest group of AMA-affiliated clubs with a vested interest in electric flight and electric-flight competition.

Formed by Larry Sribnick of SR Batteries, the NEAC is essentially an AMA lobbying group that hopes to unify the electric fraternity and provide the representation necessary to ensure the continued growth of the segment. In theory, the NEAC will act as a focal point for its members' needs and concerns and will, in turn, advise the AMA. Who may join this new council? Any AMA-sanctioned club may become an associate member of the NEAC, provided at least five of its active members fly electrics regularly. However, for a club to become a full, voting member, it must have in its ranks at least 10 dedicated electric fliers. From its membership, each NEAC club will choose one person to act as a liaison between the club and other representatives of other affiliated clubs. This communication will be facilitated by an e-mail service set up specifically for club representatives and coordinated by the NEAC's chairperson and co-chairperson (elected by the members, they'll each serve terms of two years.)

In essence, the NEAC is a roundtable for those who wish to see the growth of electric flight. And if it can operate according to Sribnick's philosophy that it have "no dues, no power, no politics" (all incurred expenses are the responsibility of the member clubs), it's easy to believe that we'll soon be seeing its effects in the form of a better-organized, and perhaps larger, electric-flight community. How effective will the NEAC be? The AMA had decided not to have any Electric Nationals for the '95 season. In its first official act, the NEAC successfully lobbied to reverse that decision. The Electric Nats will be held in Muncie, IN, with tentative dates of June 23 through June 27. Individuals or clubs wishing to learn more about the NEAC should contact Larry Sribnick at (516) 286-0079.

GIANT-SCALE RACING UPDATE

The annual executive board meeting of the Giant-Scale Racing Association (GSARA) took place on December 3 in Phoenix, AZ. Rob Wood—our giant-scale racing correspondent—was in attendance and reported that, for the first time, elected pilots' reps Duke Crow and Bob McClung participated in the meeting and brought a list of concerns that had been gleaned from discussions with pilots and team members who had competed in past races. Also present was AMA District 10 VP Richard Hanson, AMA competition coordinator Steve Kaluf and the GSARA board.

The board tackled some tough issues, ranging from the election of board members in a staggered rotation to technical specifications for Formula One and AT-6 racing. GSARA has voted to continue the 4.6ci displacement maximum and 13-percent airfoil maximum thickness for Formula One aircraft. The board voted to cooperate both with the AMA and the Galveston racing group—High-G Promotions—to develop a set of mutually acceptable rules for the new Golden Age racing class. Although the discussions invariably included widely divergent points of view, Rob reports a consensus was reached on every issue on the agenda. This meeting bodes well for the future growth of the sport of giant-scale racing. ■

MODEL AIRPLANE NEWS

Group Publisher	LOUIS V. DeFRANCESCO JR.
Publishers	DR. LOUIS V. DeFRANCESCO YVONNE M. DeFRANCESCO
Associate Publisher	GARY DOLZALL
Group Editor-in-Chief	TOM ATWOOD
Executive Editor	FRANK MASI
Senior Editor	CHRIS CHIANELLI
Associate Editor	GERRY YARRISH
Assistant Editor	DEBRA D. SHARP
Copy Director	LYNNE SEWELL
Senior Copy Editor	KATHERINE TOLLIVER
Special Publications Manager	KAREN J. HUBER
Managing Art Director	ALAN J. PALERMO
Associate Art Director	BETTY K. NERO
Graphic Artists	ROBIN DEMOUGEOT MICHAEL BOUSE
Staff Photographer	WALTER SIDAS
Systems Manager	GORDON OPPENHEIMER
Director of Marketing	GARY DOLZALL
Circulation Manager	JEAN BINGHAM ABBOTT
Marketing Manager	MICHELLE HAMILTON
Production Manager	MARY REID McELWEE
Production Assistant	ARLENE MELKO
Advertising Manager	SHARON WARNER
Advertising Account Executives	SHELLEY BYINGTON JILL E. SHERTER JILL ELLEN MOLINARO JENNIFER IZZO
Advertising Traffic Coordinator	ELISE SILKOWSKI

UBSCRIPTION PRICES: U.S. & Possessions (including APO & FPO): year (12 issues), $27.95; 2 years (24 issues), $49.95. Canada: 1 ear, $43.82; 2 years, $81.27 (Canadian prices include G.S.T.). sewhere: 1 year, $40.95; 2 years, $75.95. Payment must be in U.S. nds. Single-copy prices: $3.50 (USA); $4.50 (Canada). Canadian .S.T. registration no. R130754872.

ODEL AIRPLANE NEWS (ISSN 0026-7295, USPS 533-470) is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. onnecticut. Editorial and Business Offices, 251 Danbury Rd., Wilton, T 06897. Phone: 203-834-2900. FAX: 203-762-9803. Michael F. oyle, Chief Executive Officer; Y.P. Johnson, President; G.E. eFrancesco, Vice President; L.V. DeFrancesco, Secretary; Yvonne M. eFrancesco, Treasurer. Second Class Postage Permit paid at Wilton, onnecticut, and additional Mailing Offices.

ONTRIBUTIONS: To authors, photographers, and people featured in is magazine, all materials published in *Model Airplane News* become *e exclusive property of Air Age, Inc., unless prior arrangement is* ade in writing with the Publisher. The Publisher assumes no responbility for unsolicited material. Only manuscripts and supporting mateal accompanied by an SASE will be returned.

DVERTISING: Advertising rates available on request. Please send dvertising materials, insertion orders, etc., to *Model Airplane News,* dvertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. hone: (203) 834-2900. FAX: (203) 762-9803.

HANGE OF ADDRESS: To make sure you don't miss any issues, send our new address to *Model Airplane News,* Subscription Dept., P.O. ox 428, Mount Morris, IL 61054, six weeks before you move. Please clude the address label from a recent issue, or print the information actly as shown on the label. The Post Office will not forward copies less you provide extra postage. Duplicate issues cannot be sent.

OSTMASTER: Please send Form 3579 to *Model Airplane News,* P.O. ox 428, Mount Morris, IL 61054

Member Audit Bureau of Circulations
PRINTED IN THE USA

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

PRAISE FOR FLIGHT SIMULATORS

I'm a disabled engineer who has had many more days of "flying" from bed rather than at the field; your magazine is a great source of relief for me on those bad days.

In your most recent issue, Mal Richards of New Zealand commented on the effectiveness of a flight simulator. I was once a GS-13 project manager at the Air Force's former R&D facility for flight-simulation training research at Williams AFB, Chandler, AZ. I, too, have recently been surprised at the effectiveness of such fairly "rudimentary" flight simulators (compared with $30 million research devices).

Another disabled modeler who I helped get started was making slow progress because he was chronically ill and unable to fly often. He saw an ad for Dave Brown's flight simulator and asked me about it. I encouraged him to give it a try.

He had a relapse and was grounded for about four months, during which he flew his flight simulator. When he returned to the field, I put him up on the buddy box expecting to have to start back at square one. Wow! He was able to solo easily. I showed him a proper landing pattern and approach and suggested that he practice those on the flight simulator. Next time out, he looked as though he had been flying twice a week for three months! He's quite good now and has never crashed.

No one should learn R/C without a flight simulator, if it's at all possible. Clubs should be more aggressive in promoting their use (perhaps having a loaner system) because we could keep a lot of newcomers interested who would otherwise become discouraged because of slow progress or costly crashes. Of course, buddy boxes and good instructors will always be required, but it will be a lot easier on their stiff necks if a flight simulator is employed.

I'd sure like to hear about—or from—more disabled modelers.

R. BRUCE McCREARY
HC 63, Box 7187, 2 Hansa Ln.
Snowflake, AZ

Bruce, thank you for your comments. Flight simulators can certainly help beginners to build confidence and avoid crashing. In the April '95 issue, Dave Garwood will explore flight simulators that are on the market today. DS

CALLING FOR A KIT

Rich Uravitch has hit the proverbial nail on the head this time with his LTV A-7 Corsair II (January '95). I agree with him that the industry is missing the boat when it pushes the larger .40-style trainer aircraft as a first kit. For example, my Sierra has a large, 60-inch wing. Don't get me wrong; it has the best building instructions, plans and kit that I've seen. But I bought a Chevy S-10 pickup just to haul it around.

Back to the point: I want the Corsair II in a kit. We have very few aircraft hobby shops in my area. Most of our supply buying is done by mail order—kind of tough for scratch-building. I'm sure that you'll be getting a load of letters requesting this plane as a kit. We'll all be waiting and watching for the kit manufacturer's name. This Corsair A-7 will be the kit of 1995.

RON McCUE
Ballstow Lake, NY

Ron, we're glad you enjoyed Rich's article. Although I don't know of any manufacturer's plan to offer a kitted A-7, I'll keep my eyes and ears open. As soon as I have the scoop, you'll read about it in the magazine. Meanwhile, are any manufacturers listening? CC

SCALE COCKPITS

I've been reading *Model Airplane News* for a few years now and enjoy it very much—especially the articles about scale models. In the *January 1993 issue,*

you wrote a "Field & Bench" on a Balsa USA 1/3-scale Piper Cub that you converted to an L-4 Grasshopper. In the same issue, Frank Tiano's "Sporty Scale" column included some close-up photos of your scale cockpit details. I'm presently building a Balsa USA 1/4-scale Cub and would like to include the same degree of detail in my model.

Walter Garrison
Walpole, MA

Walter, I think that larger scale models need more details if they're to look right. This holds true for the cockpit—especially for models that have a lot of windows.

The Balsa USA 1/3-scale Cub kit has a ready-made aluminum instrument panel with instrument face openings already cut. I added the bezel-mount screws around each opening and the various placards. The vacuum-formed seats come with the kit, but the rudder pedals and control sticks came from my junk drawer, and I added them to a removable floorboard. Make and paint the parts outside the cabin and then install them.

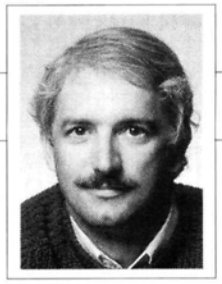
I made the placards with a Macintosh PC and a drawing program called "Aldus Freehand." I print out my various placards on sticky-backed label paper so that when I cut them out with a razor knife, I can peel the backing paper off them and stick them in place. To enhance their appearance, I apply glossy clear tape over the placard and burnish it before I cut the item out. This makes them look "laminated."

You can use a PC to duplicate just about any marking, including instrument faces, radio dials and checklists or operator manuals. For more information on making scale cockpit details, see my "How To" article in this issue. GY

ERRATA

We apologize for the omission of the second page of Dave Shadel's "Pylon Racing" in the January '95 issue. For a reprint of the article, call (203) 834-2335, or write to us at 251 Danbury Rd., Wilton, CT 06897.

AEROBATICS MADE EASY



DAVE PATRICK

KNIFE-EDGE LOOP

THIS COLUMN missed some issues, but will be appearing on a regular schedule in future months. The Tournament of Champions (TOC) took more time than I had anticipated and was really an incredible event. I won't go into detail, as Norm Staub will be covering the TOC in the next issue, but I will say that even though it was a huge project for me (and lady luck forgot us a bit), I still look forward to another opportunity to participate in what I feel is the greatest R/C event in the world.

IS IT POSSIBLE?

The knife-edge loop may seem impossible, but didn't they also say that bumblebees couldn't fly? So let's ignore what "they" say can and can't be done and be a little creative. The first knife-edge loop I saw was performed by Steve Rojecki (at the '84 TOC which, I believe, he won). He was flying a Reed Falcon biplane, and no one believed it! Looping from knife-edge, performing a *round* loop, then finishing at the same altitude, all in a knife-edge attitude, was, of course, impossible. Right?

The next time I saw one, it was my own attempt. I was piloting a CGM* Ultimate Bipe and trying to copy what I had seen Steve do, and I'm telling you, it takes a special airplane and some nerve. But if you are successful, it can be very spectacular. Learn this maneuver, and you will join the fairly small group that can do the knife-edge loop.

LET'S TALK PLANE

I've heard: "Wow, to do that you must have a *lot* of rudder." Well, in reality, the size of the rudder is not the critical ingredient. It takes a combination of plenty of well-distributed side area, lots of power and a powerful rudder. The Ultimate is a good design for this, particularly because it has a tremendous amount of side area near the aircraft's CG. This helps keep the airplane stable in knife-edge. Also, because it's a biplane, when the fuselage becomes a lifting body, I believe the two

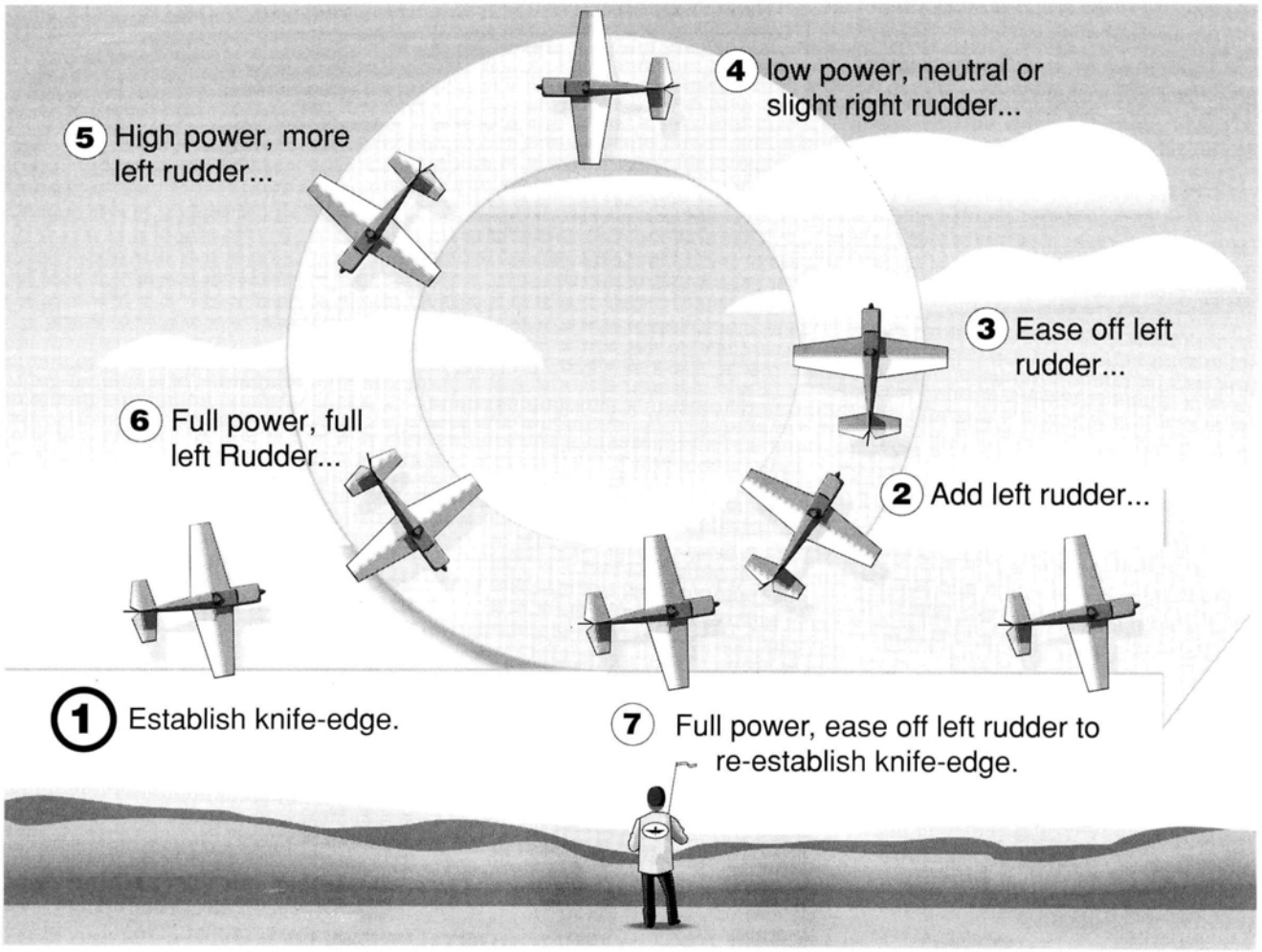


ILLUSTRATION BY DALE TREECE

❖ The New Aristo-Valiant Tracker ❖

50 RF Channels Synthesized, Scanning + Full Computerization

POLK'S MODEL CRAFT HOBBIES INC., 346 BERGEN AVE. JERSEY CITY, NJ 07304
PHONE 201-332-8100 FAX 201-332-0521

Is this the Ultimate Computerized Radio?

Aristo-Craft has been making radios since 1950, starting with single channel systems. This time we challenged our engineers to come up with the world's safest, bullet proof, feature filled, and user friendly radio! They more than exceeded our specs for our dream radio!

Aristo-Craft learned how to make a 50 channel synthesized radio and included scanning with the Valiant 8, and have now enhanced the functions to the ultimate radio of the 1990's.

Features included are:

- **PPM or PCM selectable**
- **5 Model Memory**
- **Expotential**
- **Trim Memory & Rate**
- **Tx & Rx Bat. Check**
- **Aileron Differation**
- **Flaperons & Elevons**
- **V-Tail**
- **Countdown Timer**
- **End to End Point adj.**
- **Mode 1 or Mode 2**
- **Fast Servo Response**
- **50 RF Channel**
- **Scanning and R.S.S.I.**
- **2 Mixes - 3 Way**
- **Dual Rate Adjustable**
- **Bullet Proof Receiver**
- **Low battery warning**
- **Permanent Memory Settings w/Cmos chip**
- **Last Freq. Retention.**
- **Helicopter Compatible**
- **Cross trims**

The New Valiant Tracker is as Smart as it is Beautiful Fully computerized, programmable, scanning, and synthesized 50 channel selection without crystal change!

The Valiant uses state of the art Surface Mount Technology to insure perfect boards, and the boards are computer checked during production. Additionally, the Valiant Tracker has a self test every time the radio is turned on.

The connection between the transmitter and the receiver is accomplished through a communication cable to the mounted switch on the outside of your model. **All settings remain permanently in memory even if battery is removed.** Safety requires that scanning is required each time you change frequencies. All flag combinations are provided, so that full compliance with A.M.A. rules and compound etiquette can be maintained.

The Valiant Tracker is F.C.C. approved, and a ***patent is pending*** for the scanning and synthesizing of frequencies. **Please note that it is impossible to transmit on to a frequency in use** even in a field several miles away or on to a frequency with interference.

Therefore, it is impossible to shoot someone down by mistakenly turning on your radio while someone else is flying. We can't emphasize enough that ***this feature alone makes the Valiant the safest radio in Model Aviation History!*** **Available on 72 or 75 Mhz and Mode 1 or 2. Optional 6 additional on/off channels available w/decoder in separate case. All foreign frequencies will be available from agents. In Europe see Powermax.**

The Safest and Most Bullet Proof Radio!

POLK'S HOBBY has been in the hobby business since 1935, and their founders, Nat and Irwin Polk were founding members of the A.M.A. and are members of the Hall of Fame. This radio is not a fantasy from a new company, but the most serious project to bring deluxe capabilities to flyers at affordable pricing.

Our reputation of 60 years of supplying the hobbyist is on the line, and we want to make the Valiant everybody's basic radio of choice to do so we assembled an engineering team of experienced radio engineers to introduce ground-breaking technology to you.

Polk's will offer a **money back guarantee** to any member from each A.M.A. approved flying club for testing. Fly for 30 days without risk, and if you don't agree that the Valiant Tracker is the "Ultimate" radio than you can return the radio to us for a full refund. This offer is valid through 06-30-95

8 Ch Dlx. Sys. *$479.95
6 Ch Std. Sys.(1995)$379.95
Spare Receiver $149.95
Opt. 6 on/off $ 99.95

***SECOND RX DIRECT FROM ARISTO AT 1/2 PRICE WITH PROOF OF SALE! (INTRODUCTORY)**

wings help to capture the air and, possibly, this contributes to the lift generated by the fuselage.

The interplane struts also help as they, too, are little wings, and every little bit of lifting area is important. There are not many monoplanes that can successfully perform the knife-edge loop, but there are a few. I have been fairly successful with the CGM Sukhoi, and the Godfrey Extra 300 on a 4.2 worked well (note that the Godfrey 300 has a large canopy near the center of gravity).

Power? Yes, it takes a lot. The better suited the airplane (as described above), the less power you'll need to complete the maneuver. Speed is not the objective here, but thrust is, so select your propeller accordingly. Again, for the CGM Ultimate, I use a YS* 1.20 (the standard, older version works well), 25-percent nitro, 2-stroke Power Master* fuel and a 16x8 APC* propeller. This setup, incidentally, is a great all-around combination for all types of unlimited-style aerobatics.

Now, as for the rudder, you'll need a sizable one and strong servos. When your aircraft is flying at high speed, especially at the bottom of the loop, there are tremendous stresses on the rudder (for that matter, there are tremendous stresses nearly everywhere on the plane). Once, when performing a knife-edge loop with an Ultimate, all was great until, at the bottom, when I was just about to complete the loop, the aircraft seemed to explode. The crash was spectacular, and I just stood there wondering what had happened. Although there were a lot of spectators, it wasn't clear to anybody what had happened.

Fortunately, a modeler had videotaped the event. It was determined that the interplane strut had collapsed under the side air-loads. I then remembered that I had used extra-light wood on the interplane struts and elsewhere to save weight. That had probably caused the failure. The stresses accompanying unusual aerobatics really can be severe, so please be aware and be careful.

SETUP

The airplane you're going to try this with really should be able to knife-edge easily and climb readily when extra rudder input is applied. Also, you should be able to add rudder without unwanted pitching or rolling. In other words, when you roll to knife-edge and input rudder to sustain the flight path, the aircraft should track straight ahead.

HOW IS IT DONE?

The maneuver gives a very unusual visual presentation and, at the bottom, it can really get the heart rate up, especially the first few times you attempt it! I would, of course, recommend that you start with the plane that's fairly high in the sky. Let's start from left to right at full power. Roll right to knife-edge (90 degrees), and apply enough left rudder to sustain horizontal flight. Then, when you're feeling happy with how the plane is flying in knife-edge, slowly add more left rudder until you reach the three-o'clock position. At that point, start reducing left rudder input, so that by the time you reach 12-o'clock, you will be at neutral rudder. In fact, I sometimes find I need a bit of right rudder over the top—from the one-o'clock position to about the 11:30 position.

Now throttle back—yep, back to about 15 percent or even idle, and start adding left rudder again. At about nine-o'clock, power up to full and, by now, you should be up to full left rudder once again. This is the part that takes nerve as the aircraft is losing altitude at a very high rate. Incidentally, whenever you're performing aerobatic maneuvers, you should have a bail-out plan, and here is no exception. A good thing to keep in mind is that once you're in the knife-edge attitude, you are only a quarter roll from getting out quickly—just in case!

Once you have completed the loop, roll out of knife-edge, and you're on your way. After you're comfortable with the maneuver flown from left to right, don't forget to learn it from right to left. Good luck on mastering this one. See you next month!

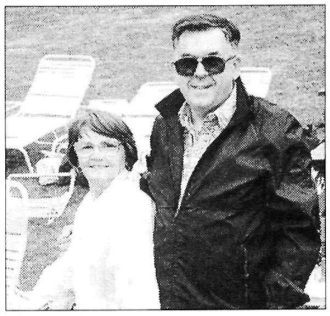
**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

AstroFlight News

Astro Dominates APBA Electric Nationals

June 26, Tacoma Washington

Team Astro Cobalt Racing Motors dominated the third Annual APBA Electric Boat Nationals held in Tacoma, Washington on June 26. Seven out of eight first place trophies were won by Astro powered boats. Astro's new SUPER-HOT FOUR-TURN marine motors powered a number of winners. These two new motors deliver peak horsepower at 25,000 RPM. They are now available as Model #306 (05-size for 7 and 8 cells) and Model #326 (25-size for 12 cells).



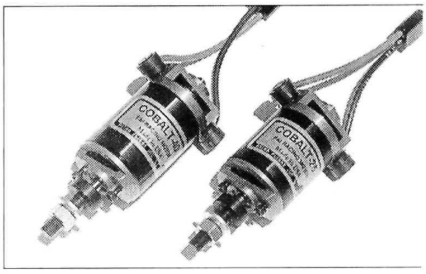
Bob and Suzanne Boucher enjoying the action at the APBA/DPI Leisure Sports Nationals.

EVENT	*PLACE*	*DRIVER*	*BOAT*	*MOTOR*
1/16 Scale Unlimited	*1st*	*Bob Welch*	*DPI American Dream*	*Astro #306*
7-Cell Open Hydro	*1st*	*Bob Welch*	*DPI American Dream*	*Astro #306*
7-Cell Open Hydro	*3rd*	*Jeff Vasquez*	*Electrolite*	*Astro #306*
12-Cell Open Mono	*1st*	*Greg Schweers*	*Black Diamond*	*Astro #305*
12-Cell Open Mono	*2nd*	*Mark Walburn*	*Graupner Monster V*	*Astro #305*
12-Cell Open Hydro	*1st*	*Jeff Vasquez*	*Jeff's Rigger*	*Astro #325*
12-Cell Open Hydro	*3rd*	*Mark Yordy*	*Fastoy's Rigger*	*Astro #325*
12-Cell Sport Hydro	*1st*	*Bruce Mooring*	*D.F. Oberto*	*Astro #325*
12-Cell Sport Hydro	*3rd*	*Ross Hatte*	*Hatte Custom*	*Astro #325*
12-Cell Open Tunnel	*1st*	*David Carriker*	*Schweers Tunnel*	*Astro #305*
12-Cell Open Tunnel	*2nd*	*John Starks*	*Stark's PMP Tunnel*	*Astro #325*
12-Cell Open Tunnel	*3rd*	*Paul Dunlap*	*DPI Tunnel*	*Astro #325*
Anything Goes	*1st*	*Jeff Vasquez*	*Jeff's Rigger*	*Astro #325*
Anything Goes	*2nd*	*Ray Hernandez*	*MRP Fountain*	*Astro #340*
Anything Goes	*3rd*	*Randy Naylor*	*Blew By You*	*Astro #325*

New Super-Hot FIVE TURN Competition Airplane Motors

Astro reveals its new Five Turn Competit series of Cobalt airplane motors. Thes motors have been totally redesigned for ***maximum power*** at ***minimum weight.*** The i field ring that houses the Cobalt magnets ha been eliptically machined to remove as muc weight as possible *without* sacrificing any magnetic field strength. The machined aluminum endbells have a new open design maximum air-cooling and minimum weight New silver **LAY-DOWN** brushes can safel handle up to 75 amps current draw without sparking and brush life has been greatly increased.

These new Astro Elliptical Motors will ***fly rings around the competition!***



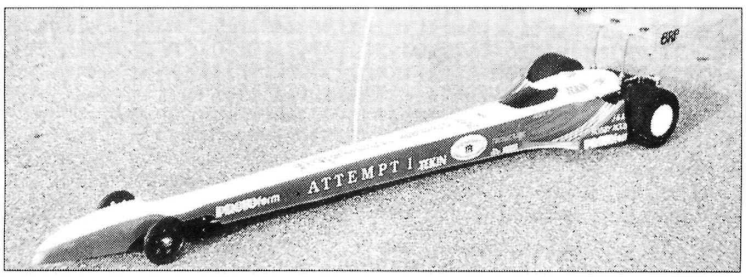
FASTEST R/C Car in the WORLD... 105.6 MPH!

June 12, Sunnyvale, CA.

The R/C Land Speed Record was shattered at the first NCDA Top Fuel Invitational drag race held on June 12 at the NCDA Speedway in Sunnyvale, CA. **Georg Esterer**'s history-making Astro Top Fuel II powered Lightz-ProtoForm dragster became the first wheel-driven R/C car to officially exceed the 100 MPH speed barrier.

George fired his specially-built "Attempt-1" down the 300-foot course and through the dual-backup photocell speed traps at an amazing **105.6 MPH** (105.5 backup)!

In the Drag Racing competition, **Sylvester Grisby**'s Astro-powered *"Fireman"* captured the Top Fuel title, and **Mike Ogle** took top Honors in Top Fuel Unlimited and Low E.T.*(1.84)* with his Astro-powered dragster.



Georg Esterer's Astro Powered "Attempt 1"

For more information, see your hobby dealer or call AstroFlight directly at (310) 821-6242.

COMING SOON:

• The "Electric Motor Handbook" by Bob Boucher...

This all-new book tells you the Why, What, and How of Electric motor theory and practice. This book reveals the secrets of motor building and tells you how to get the most from your motors. The Handbook topics covered include: calculat speed and torque, determining motor constants timing for sparkless commutation, propeller selection, and gearing. Mechanical drawings a performance curves for all Astro Motors are included. A MUST for the hi-tech racer!

• New Digital Speed Contro

Astro has joined the digital revolution, and wi soon release its first electronic speed controls incorporating its new proprietary ***Astro 2001 computer chip****. These new high-rate controls w be smaller in size and lighter in weight, have higher efficiency, and will be* ***more affordable*** *than any other digital speed controls now on th market.*

Astro Flight, Inc. • 13311 Beach Ave., Marina Del Rey, CA 90292

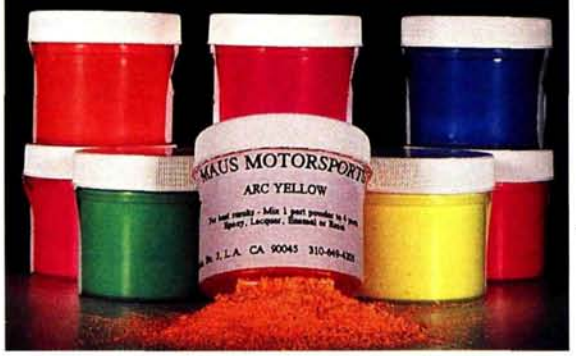
AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

Fire in the Sky

A new, super-visible, fluorescent paint pigment is now available from Maus Motorsports. Just mix the fine powder with any clear, non-water-based paint, and spray the mixture using a paint gun. The slightly translucent colors include Rocket Red, Neon Red, Blaze Orange, Arc Yellow, Saturn Yellow, Signal Green, Horizon Blue, Corona Magenta and Aurora Pink. When they're applied over a white base coat, the results are startlingly vivid, and your model's visibility is greatly enhanced. To light up the sky, contact Maus Motorsports, 10200 Glasgow Pl., Ste. 3, Los Angeles 90045; (310) 649-4205.



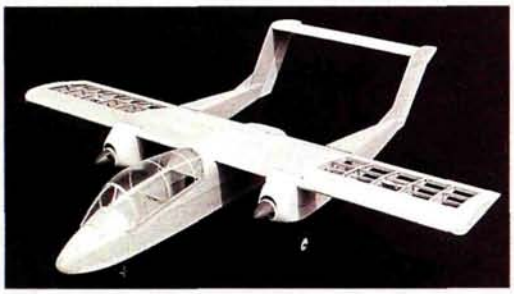
A 6-FOOT ONE

Matt Mrdeza built an exact-scale prototype model (shown right) for the designer of the full-scale One Design—Dan Rihn—before the full-size design had been completed. Now he introduces a kit with a 72-inch (6 feet) wingspan. Developed in cooperation with the IMAC board, the production kit (left) features improvements such as a bigger vertical fin and slightly longer tail moments. The all-wood kit includes full-size plans, a tail-wheel assembly, a fiberglass cowl, canopy and wheel pants and aluminum main gear. It's IMAA-legal under the 25-percent rule, and it's available for $249 (plus $18 S&H). Contact Cutting Edge Aero, 10929 E. Firestone Blvd., Norwalk, CA 90650; (310) 929-0529 (evenings).

Re-enact a Luftwaffe landfall on the *White Cliffs of Dover* at your favorite slope-soaring site with Model Tech's new Me109 Power Scale Slope Glider. Like Model Tech's P-51, the Me109 comes completely built and sanded, so it's virtually ready to cover; in fact, Hobby Shack, its distributor, calls it "Immaculate Construction™," because they say they've never seen anything this perfectly hand-crafted before. This highly aerobatic slope soarer features a D-tube, semisymmetrical airfoil for strength, speed and maneuverability. For even more stunt fun, experienced builders may add an optional rudder, and electric power is also an option. Specifications: wingspan—45.5 inches; wing area—352 square inches; weight—30 RTF; wing loading—12.3 ounces per square foot; list price—$115. Contact Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452. Hey Model Tech, how about a Spitfire for the slopes to complete the scene?

MESSERSCHMITT OVER DOVER!

AMERICAN OBSERVER



The most widely used, most sophisticated, forward-air control aircraft used in South East Asia was the North American/Rockwell OV-10 Bronco, which the Marines still use, by the way. Now our famous, highly trusted designer Rich Uravitch brings us his version of this twin-powered workhorse. This 4.5- to 5.5-pound model has a 52.5-inch wingspan and 551 square inches of wing area. It requires two .15 to .25 2-stroke/cycle engines, but the design should lend itself *extremely* well to electric power as well. Rich's prototype uses two of the finely made HP Gold Cup .20s from MECOA. Like other Uravitch designs, the Bronco should be easy to build as well as a great performer. Drop me a line if you like this one, and we'll schedule it for publication as soon as we can. For plastic parts for this and other Uravitch aircraft, contact Rich Uravitch, 15 Newcomb Trail, Ridge, NY 11961; phone/fax (516) 929-4132.

Fly it Like a Fixed-Wing

According to Great Planes, not only does the affordable HyperFly electric helicopter fly like a fixed-wing model, but it can also be assembled at a leisurely pace in one day. The HyperFly's gear train is very basic and easy to understand; there's no tail rotor. A clear plastic under-cambered plate controls yaw in forward flight. The entire drive system, including a Le Mans AP29, comes installed. No special servos are required; the servo mount holds servos of standard size and can be adjusted to accept lighter mini- or micro-servos. Unlike other helis, the HyperFly's fixed-pitch, 33.5-inch rotor doesn't require complex tracking and pitch adjustments. A special "landing cut-off switch" automatically shuts down the motor for smooth, safe touchdowns. It requires a 2-channel radio (aircraft frequency) with two servos, a 7.2V 1000mAh Ni-Cd battery and a charger. HyperFly is the perfect vacation R/C model. It's quiet and will fit in a standard car trunk.

JR NEB-480

More than just a beacon...

The new JR NEB-480 Model Beacon is a compact, light (only 11 grams) battery alarm that tells you your battery-charge status. During a preflight check, two LEDs indicate battery voltage levels; an audible alarm doubles as a low-voltage "Don't fly" warning and has a loud (80dB) homing buzzer that will help you to find a downed aircraft. Compatible with 4.8V systems only, the unit is easy to install, and it can be used with JR, Futaba, Hitec and Airtronics (with polarity correction) radios. List price—$49.95—a small investment that buys big protection.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1995. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

RARE STINSON "O" IN 1/4 SCALE

Gene Spaulding of Dallas, TX, sent this photo of his beautiful, scratch-built ¼-scale Stinson model "O." According to Gene, Stinson produced only six of these planes, most of which went to China and Central America. Gene's 29-pound model has a 126-inch wingspan and is powered by a SuperTigre 3000 with a Davis Diesel head. The Stinson is covered with Dacron, is rib-stitched and is painted with System III water-based epoxy. The model shares a hangar with Gene's full-size Glasair.

GREEN FALCON

Based on a full-size modified Pitts, this Falcon Green Machine belongs to Ricardo Calero of Port St. Lucie, FL. He built the 21½-pound model using a kit and plans from Balsa Trading. The plane has a 74-inch wingspan and a 69-inch-long fuselage, and it's powered by an Eagle Sachs 4.2ci engine swinging a 22x12 prop. It's a beauty, Ricardo.

BEAUTIFUL BELLANCA

Builder Bill Smallwood (right) of Abbotsford, B.C., Canada, and test-pilot Bill Pottage show off the very unusual Bellanca Aircruiser CF-BTW. Wingspan is 130 inches and power comes from a Quadra 50 gasoline engine. The scratch-built model uses spruce and foam-board construction and is covered with Sig Koverall. Bill Smallwood has been building R/C models for 50 years and built the Aircruiser using line drawings and photos for references.

NO PLANS REQUIRED

Johnny Gonzalez of McAllen, TX, built this flying machine, "Paraso Locust," without having drawn any plans! The craft is constructed of white pine and birch plywood covered with MonoKote. The 103-inch-span craft weighs 15 pounds and is powered by an ASP "redhead" engine. Johnny says that it's a slow, stable flier throughout the speed envelope.

FLAT-TOP FIGHTER

This F6F-3 Hellcat is the handiwork of Bob Upton of Montgomery, TX. Bob spent three and a half years building and finishing the Byron kit, which he enhanced with details such as a full-scale cockpit with a gun sight; a "bullet-proof" window panel; a seat-belt harness; night lights; and a sliding canopy. The 30-pound 'cat is painted with K&B Superpoxy and has simulated panel lines and rib stitching and fabricated trim tabs for ailerons, rudder and elevators. Bob says that he flies the Hellcat with a scale 3-blade prop and, although the craft isn't exceptionally fast, "It sounds and looks just fine in the air."

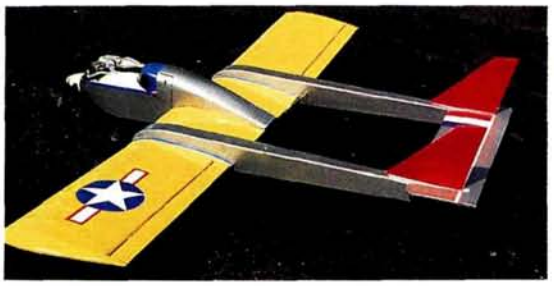
PILOT PROJECTS

BENT-WING BEHEMOTH

George Metaxas and George Orfanos of Beotie, Greece, sent this photo of their scratch-built F4U Corsair. It has a homemade, spring-powered, servo-activated ballistic parachute that can lower the 12-kilo craft to safety in the event of an emergency. The parachute is in a tube that's attached over the CG in front of the cockpit. The 250-centimeter-span Corsair is controlled by a Futaba radio. Although George and George tell us that finding the proper flying terrain is a problem in Greece, we think that the view is incredible!

ITALIAN DOLPHIN

This unusual amphibian biplane design is by Professor Giorgo Bassano of Sarzana, Italy. It has a 55-inch top wing and a 51-inch bottom wing and uses a Wayfarer-Hobo airfoil. The Dolphin is powered by a SuperTigre .60 engine and was built using all-wood construction.



MILLER TWIN BOOMER

Robert Miller of Lisbon, OH, designed and built this twin-boom sport model and says that it's a great flier. After he had retired, 73-year-old Rob started building and flying models with the Centaur R/C club, and he hopes to continue for many years. The model is powered by an O.S. Max .20 engine, and a 56-inch wingspan supports the 4-pound, 3-channel design. Many of the R/C club's fliers have flown Rob's model, and all agree that it's terrific.

ELECTRIC BERNARD BIPE

This electric-powered biplane is the design of Bernard Michaleski of Victoria, B.C., Canada. It has a 36-inch top wing and a 32-inch bottom wing. Total wing area is 360 square inches. The ready-to-fly weight with a WEP 3.8:1 geared motor and 18 cells is 46.5 ounces. The airfoil is semisymmetrical, and the motor turns an 11x7 prop. The finish is paint and MonoKote, and the canopy is stretch-formed acrylic film.

KANSAS CLIPPED-WING CUB

Russell Clampitt of Parsons, KS, spent 11 months building this ¼-scale clipped-wing Cub from a Sig kit, and he says that it's his first "big" airplane. Russ covered the Cub with Coverite's 21st Century fabric and used 21st Century paint for the trim. The model has an 86-inch wingspan and weighs 14 pounds. Power comes from an O.S. 1.20 4-stroker turning a 16x6 prop. Russ added scale Swenson Specialties landing gear to give his Cub true scale appearance.

CONSTRUCTION

1/4-SCALE S2B PITTS SPECIAL

Biplane aerobatics in an IMAA-legal package

by MARK SIRIANNI

Mark Sirianni with his latest creation—the 1/4-scale S2B Pitts Special.

IN 1973, I read an article about the Pitts Special and fell in love with the plane. I was in junior high school at the time, and my dream of building a Pitts Special didn't come true for more than 20 years. I searched for a good kit for a long time but, for some reason, this beautiful biplane has been ignored by many manufacturers. One of the full-size Pitts' bad habits is its so-called "squirrelly" nature on takeoff and landing. After reading the plane's background, I was a little concerned about its bad reputation. Most Pitts fliers love the way the plane handles in the air, but they're scared to death during takeoffs and landings. With this in mind, I started my design work, hoping that I could make this plane as easy to handle as possible.

SPECIFICATIONS

Name: ¼-scale Pitts Special
Type: sport scale S2B
Wingspan: 61 in.
Airfoil: fully symmetrical
Weight: 9 lb.
Radio req'd: 4 channels (aileron, rudder, elevator and throttle); two servos for ailerons
Radio used: Ace R/C MicroPro 8000
Engine req'd: .90 to 1.08 2-stroke or 1.20 4-stroke
Engine used: SuperTigre .90 2-stroke

Features: to simplify construction, the Pitts uses a Sig* no. 223 canopy, Carl Goldberg Models Ultimate bipe cabane struts and the wheel pants from the CGM Ultimate bipe kit. At 9 pounds, the Pitts Special flies exceptionally well and has very good slow-speed performance. If you've ever built and flown a biplane, you won't find the Pitts demanding or difficult to fly.

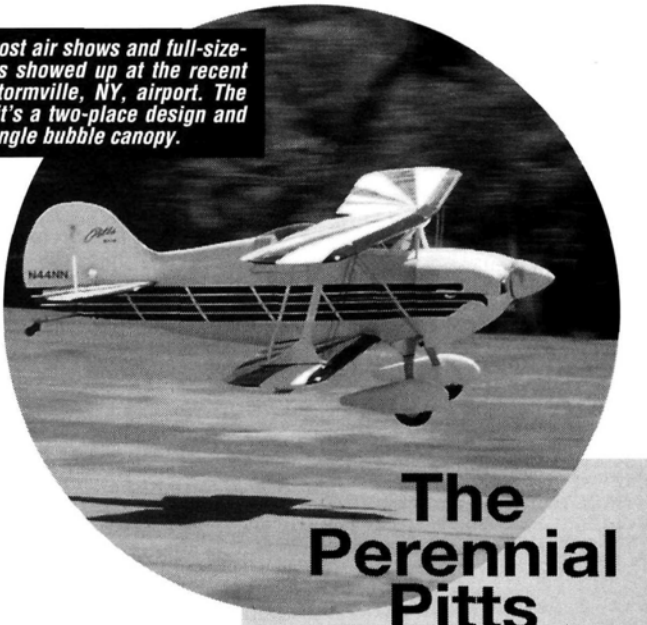


PHOTO BY GERRY YARRISH

You'll find the Pitts Special at most air shows and full-size-homebuilt meets. This S1S Pitts showed up at the recent Chapter 130 EAA fly in at the Stormville, NY, airport. The S2B Pitts differs from it in that it's a two-place design and both cockpits are covered by a single bubble canopy.

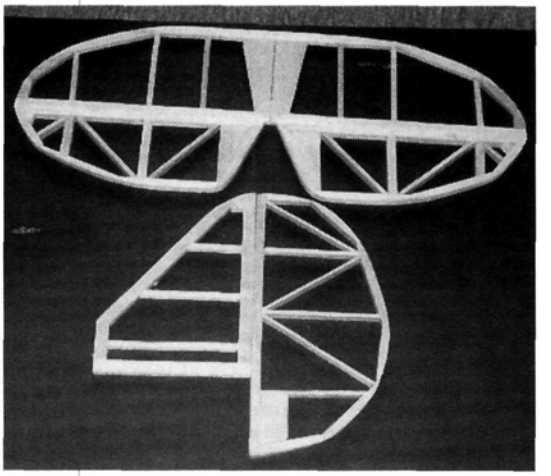
The Perennial Pitts

The Pitts Special S2B is the outstanding two-place version of the single-place Pitts Special. Equipped with a 260hp engine, the aircraft is capable of unlimited class performance even while carrying a pilot and a passenger. The Pitts S2B is the perfect aircraft for dual instruction of all aerobatic maneuvers. In addition, it's suitable for limited cross-country flying. The S2 series made it possible for more pilots to sample unlimited aerobatic flight and did much to popularize the sport.

Designed in 1945 by the legendary Curtiss Pitts, this little biplane has revolutionized the world of competition aerobatics. The Pitts Special is by far the finest aerobatic biplane ever designed. Flown by many world-class pilots, the Pitts has earned its place in aviation history.

With the introduction of the Sukhoi, the Extra 300 and the CAP 231, the Pitts Special is no longer the dominant force in world-class competition; but for intermediate to advanced aerobatic pilots, there's no better way to get started than in a Pitts Special.

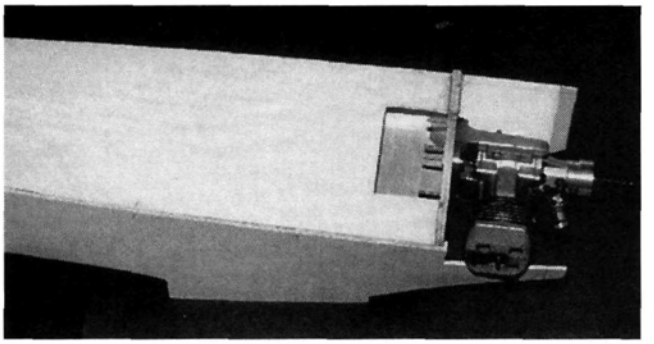
The S2B is a natural for a ¼-scale model. With a 60-inch wingspan, it's IMAA-legal and small enough to be transported easily in a small car. There are an unlimited number of color schemes available, and documentation is easy to find. *[Editor's note: Bob Banka's Scale Model Research* has 90 documentation photo packs for the Pitts Special, including eight for the S2B.]* The Pitts is a refreshing change of pace from all the Ultimate bipes now on the market. If you want to attract attention at your local flying field, just show up with your new Pitts Special, and let the air show begin. Now let's start building.



The tail parts are simply built flat over the plans. The horizontal and vertical stabs will be sheeted later with 1/16-inch balsa.

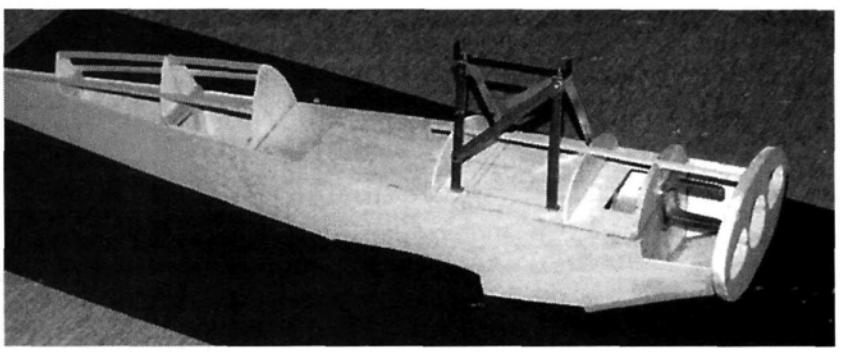
FUSELAGE

Cut the two fuselage sides out of ⅛ inch-thick lite-ply. Lay the sides over the plans, and mark the positions of formers F2, F3, F4, F5, F6 and F7. Attach your engine to its mount, and set the assembly on the plans. With the prop washer in the proper location, mark the position of the firewall. The firewall position on the plans is set for a SuperTigre* .90.



Left: here, the installed fuselage top sheet is flush with the top edge of the fuselage side. The engine, its mount and the firewall are in place.

Below: the Goldberg Ultimate center cabanes, the rear fuselage formers and stringers and the cowl former (F1) are in place.



Glue the top and bottom ¼-inch-square balsa stringers to the fuselage sides. Notice that the top stringer is glued ⅛ inch below the top of the fuselage side. This forms a

FLIGHT PERFORMANCE

After spending so much time designing and building this model, I was very nervous on the first flight. We finally got a break in the weather on a beautiful Saturday night in June. After taking a few more pictures, we double-checked everything and fueled the tank. As it turned out, the Pitts was very easy to handle on the takeoffs and landings with no bad habits. Pilots who have some biplane experience won't have any problems with my Pitts Special.

• Takeoff and landing

My takeoff was toward the setting sun, but I planned a quick right-hand turn after liftoff. The Pitts lifted off easily, but it was slightly out of trim; it made a slight left-hand turn and went directly into the sun. I was completely blinded for a few seconds, but I didn't panic and just let go of the stick. When the plane appeared above the sun, it was climbing and in a slight left turn. I kicked in some right aileron and some down-trim and the plane flew perfectly. After 8 or 9 minutes of flying, it was time to set up for landing. I made a few practice approaches and set up for final. Flaring the model just before landing slows it down quickly, and the model rolled out straight and true. At all times, I felt very comfortable flying the Pitts.

• High-speed performance

The model is well-behaved at full throttle. It climbs to altitude quickly, and all the controls are very positive. No trim change is required; the Pitts goes exactly where you point it. It's not overly fast, but it performs like a full-size Pitts.

• Slow-speed performance

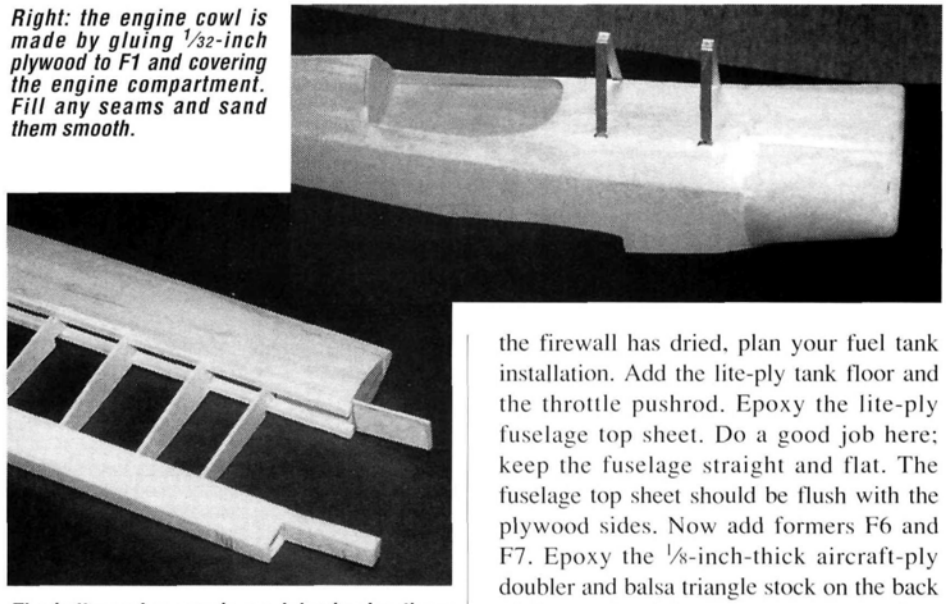
The Pitts has no bad habits; its light wing loading provides very pleasing slow-flight characteristics. Stalls are straightforward and neither tip shows any tendency to drop off at the break. Aileron control remains positive, and a bit of up-elevator control is required to maintain altitude.

• Aerobatics

After my nerves had settled a bit, I put the model through a series of loops and rolls. Rolls are fairly axial and required a little down-elevator while inverted. With the .90 in the nose, the vertical performance is good, but not unlimited. Snaps are easy to do, and the rudder has plenty of authority for knife-edge flight. Inverted flight is effortless and requires just a touch of down for level flight. The model performed exceptionally well—better than I could have imagined. This has been a very enjoyable project from start to finish. The extra work of designing and building a biplane was definitely worthwhile.

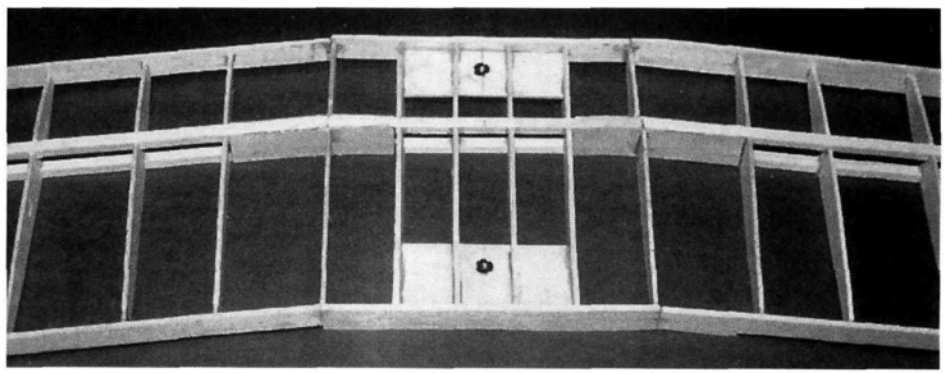
ledge to which the one-piece, 1/8-inch lite-ply fuselage top sheet (see full-size template on plans) will be attached. The fuselage is built upside-down over the top view of the plans. Slightly taper the top and bottom stringers at the rear for a good fit. Glue F3, F4 and F5 into place, and pull the tail together and glue it. Make sure that the fuselage is perfectly flat over the plans without any twisting or warping. Epoxy the firewall to the fuselage. Make sure that it's perfectly straight. Make a small cutout on the right fuselage side to allow space for the engine cylinder head to slide through. After the firewall has dried, plan your fuel tank installation. Add the lite-ply tank floor and the throttle pushrod. Epoxy the lite-ply fuselage top sheet. Do a good job here; keep the fuselage straight and flat. The fuselage top sheet should be flush with the plywood sides. Now add formers F6 and F7. Epoxy the 1/8-inch-thick aircraft-ply doubler and balsa triangle stock on the back of former F4. Mount your engine and its mount to the firewall, and carefully glue F1 and F1A to the front of the fuselage while centering the prop shaft in F1. Add formers F3T and F4T and the 1/4-inch stringers. Cut the 3/4-inch-thick balsa cowl bottom, epoxy it into place, and carve it to shape. Add F5T, F6T, F7T and the top stringer. Measure carefully on the plywood top, and drill the holes for the 6-32 bolts that will be used to attach the center cabanes. Add 1/8-inch-thick ply doublers under the holes. Attach the cabanes with screws, washers and aircraft locknuts. Make sure that the screws are very tight. After the fuselage top sheeting has been added, you won't have access to them again.

Sheet the forward fuselage and the turtle deck with soft 3/32-inch-thick balsa. Add the 1/8-inch lite-ply cowl doublers to the fuselage sides. Epoxy the 1/32-inch-thick plywood cowl sides into place. Cut the ply

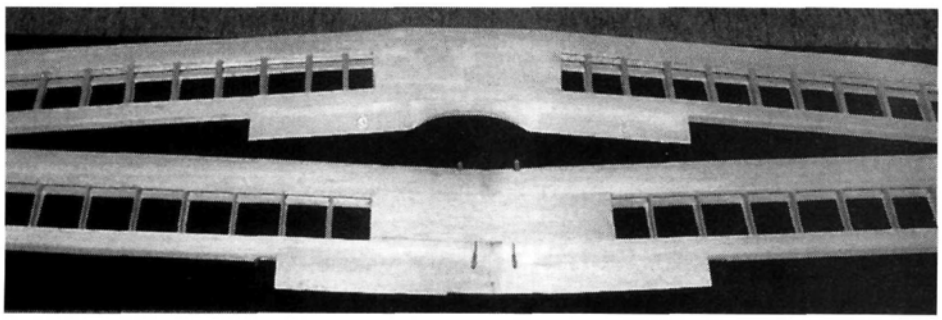


Right: the engine cowl is made by gluing 1/32-inch plywood to F1 and covering the engine compartment. Fill any seams and sand them smooth.

The bottom wing panels are joined using these front and rear dihedral braces.

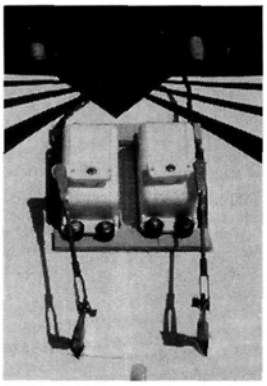


The top wing is built in three sections: the left and right swept panels and a straight center section. Notice the plywood attachment plates with 6-32 blind nuts installed.



The sheeted and sanded top and bottom wings are ready to be covered. Notice that the bottom wing has torque tubes installed for aileron control.

a little oversize, and trim it to fit. You may want to soak the cowl sides in warm water to make them easier to bend around the formers. Study the pictures before you proceed. Add the 1/8-inch-thick balsa fuselage side stringers and taper and sand them to shape. Add the 1/4-inch-thick plywood tail-wheel mount base. Fill any seams in the fuselage sheeting, and sand them smooth. Set the fuselage aside until later.



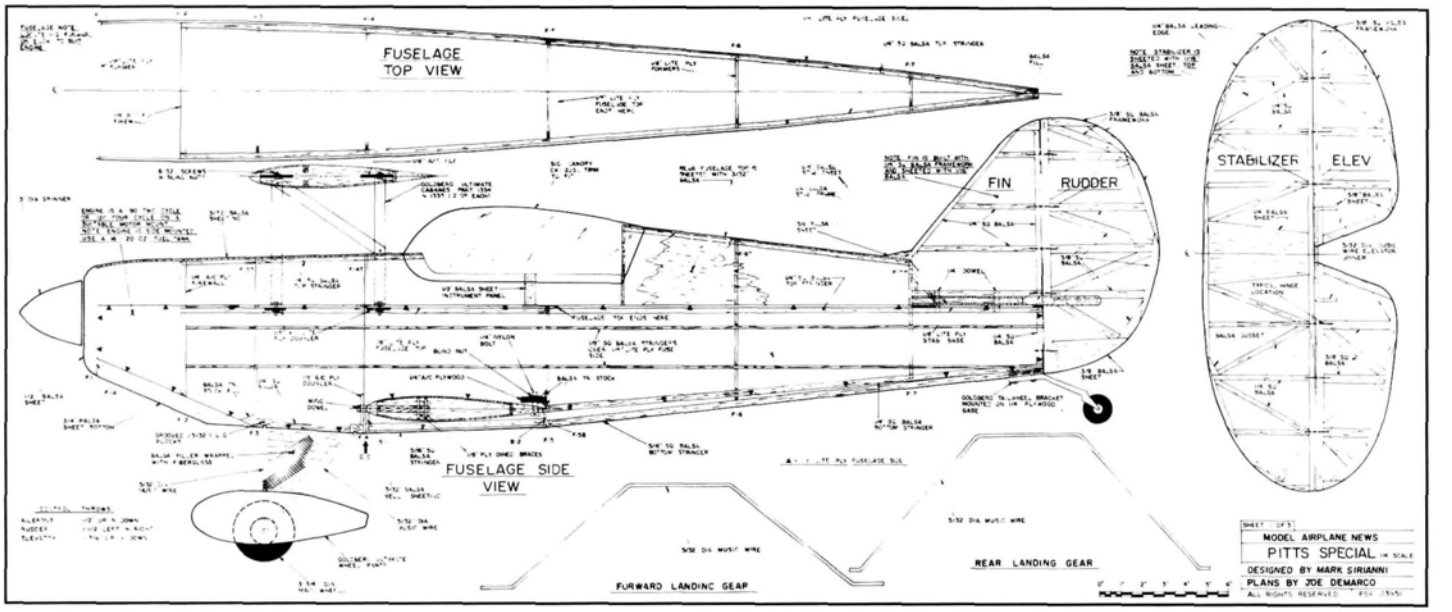
The bottom wing uses torque tubes with 5/32-inch-diameter music-wire rods for aileron control. Use two servos to control the Pitts. The model has four ailerons and needs the extra power.

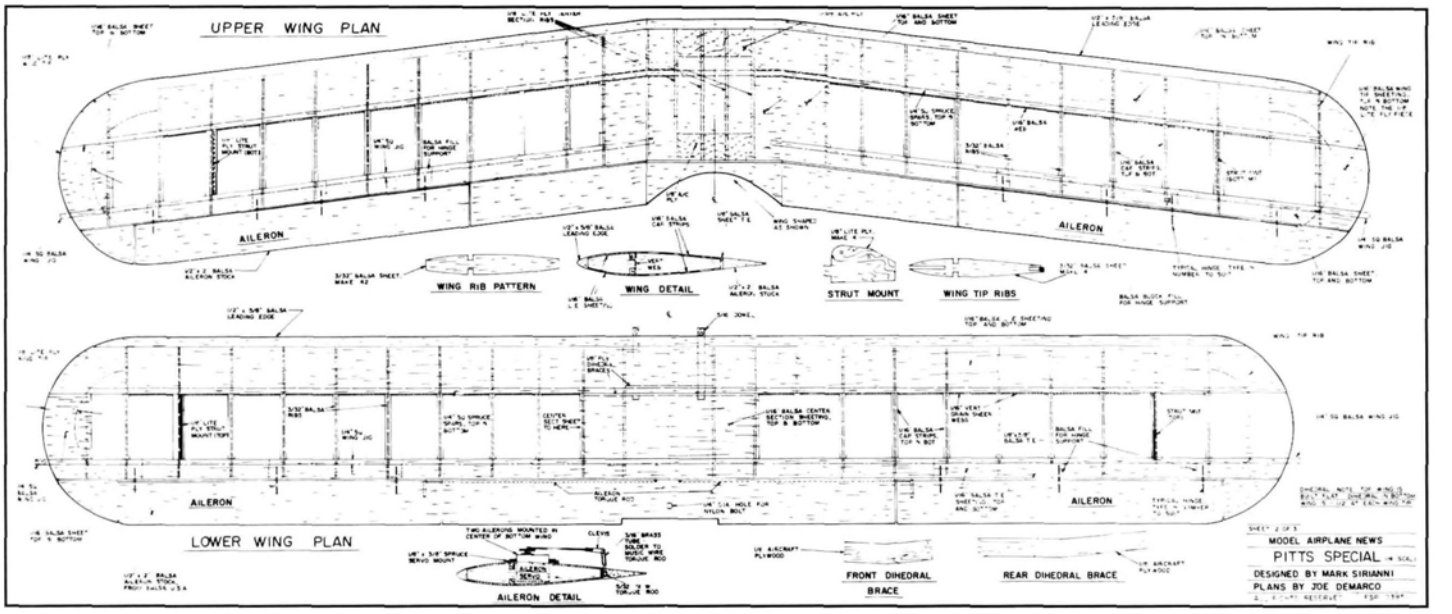
THE WINGS

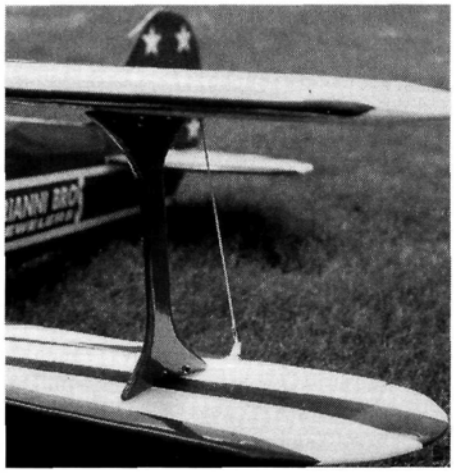
• **Bottom wing.** Cut and pin the 1/4-inch-square spruce spars over the plans. Pin the 1/4-inch-square balsa trailing-edge jig into place over the plans. Install and pin all the ribs on the bottom spar and to the jig. Glue the ribs only to the bottom spar. Add the top spar, and glue it to the ribs. Build both wing panels up to this point, then add the 1/2x3/4-inch balsa leading edges. Add the oversize vertical 1/8x3/4-inch trailing edges, and glue the 1/8-inch-thick lite-ply wingtip into place. Finally add the 1/16x1-inch trailing-edge sheeting to both panels. Keep both wing panels pinned to the jig and to the building board, and add the 1/16-inch-thick leading-edge sheeting to both panels.

• **Joining the wing halves.** Using a razor saw, cut a 1/8-inch slot into rib no. 1, and slide the front 1/8-inch-thick aircraft-grade plywood dihedral brace into place. With the left wing flat on the workbench, raise the right wingtip 3 inches, and epoxy the wing panels together. After the epoxy has set, glue the rear dihedral brace into place. Add the 1/16-inch center wing sheeting.

Here are the cabane struts in detail. They're from the Goldberg Ultimate bipe kit.





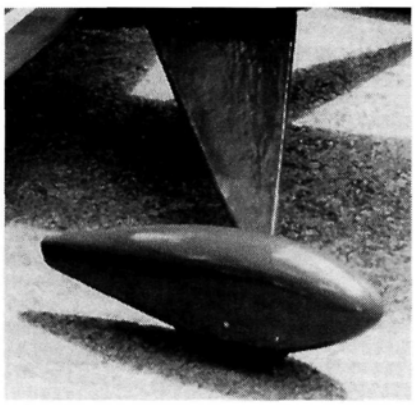


The laminated wooden interplane wing struts are bolted to the wing ribs.

The removable half of the engine cowl is held in place with alignment dowels and small screws.

Turn the wing over, and add the 1/16-inch-thick trailing-edge sheeting, the leading-edge sheeting and the bottom, center, wing sheeting. Add all the capstrips. Make the left and right aileron torque rods out of 5/32-inch-diameter music wire. I used a blue Sullivan* outer pushrod sleeve for the outer bearing. Cut the solid 1/2x2-inch trailing edge to length, and notch its front face to fit the torque rods. Epoxy it into place. I used two aileron servos on my Pitts because the wing is fairly thin and the two servos mounted in the center of the wing provided a very simple arrangement. Mount the wing on the fuselage. Drill two 5/16-inch-diameter holes in F4. Put the bottom wing in the wing saddle, and mark the hole positions on the leading edge. Drill holes in the wing all the way through the leading edge and the front and rear dihedral braces. Epoxy the dowels into place. Glue the hardwood wing mounts into the fuselage. Drill two holes through the wing's trailing edge and into the hardwood mounts. Tap the hardwood mounts for your 1/4-20 nylon attachment bolts. Fill and sand the bottom wing, and set it aside.

• **Top wing.** The top wing is built in three sections—two outer panels and a center section. Build the outer panels exactly as you did for the bottom wing. Build the center section. The center ribs are 1/8-inch-thick lite-ply. Epoxy the front and rear aircraft-grade plywood wing hold-down plates into place. Make sure that they're both level. Add the top center spruce spar. Join the wing panels to the center section. The top wing is flat and has no dihedral. Pin the trailing-edge jig back onto the plans, and put all three panels over the plans. Epoxy the 1/32-inch-thick braces on the front and the back of the spars. Add sub-ribs 1a and 1b. Draw a center line on the plywood plates, and mark the position of the top wing's hold-down screws. Drill two holes through the plywood plates, and mount the top wing on the cabane struts with 6-32 screws. Install blind nuts on top of the ply plates. Securely screw the top wing to the cabanes, and apply epoxy around the blind nuts so that they won't come loose. Add the top and bottom trailing-edge sheeting. Add the top and bottom leading-edge sheeting. Add the center sheeting and all the capstrips. Add the 1/2x2-inch trailing edge, and cut the ailerons to size. Finish the wing, and set it aside.



The Goldberg Ultimate wheel pants add a lot to the scale look of the Pitts.

• **Tail surfaces** are built flat over the plans. The fin and stabilizer are made of 1/4-inch-square balsa and are sheeted on both sides with 1/16-inch-thick balsa. The rudder and the elevator are built out of 3/8-inch-square balsa. These surfaces aren't sheeted. I joined my elevator halves together with 5/32-inch-diameter music wire.

• **Interplane struts.** The outer struts are made of 1/8-inch-thick lite-ply with 3/32-inch-thick balsa laminated to both sides. Build them with the wings installed on the fuselage and after you have checked to make sure both wings are set at the proper incidence.

FINAL ASSEMBLY

• **Removable cowl.** Using a razor saw, carefully cut the right half of the cowl off as shown on the plans. The removable portion of the cowl is held in place with screws and 1/4-inch alignment dowels. Check the photos for details.

• **Landing gear.** This is made of 5/32-inch-diameter music wire bent to shape and soldered at the axles. The gear is attached to the fuselage with grooved hardwood blocks and is held in place with screws and nylon straps. The void between the front and rear gear wires is filled with balsa and covered with lightweight fiberglass cloth.

The wheel pants are from a Carl Goldberg Models* (CGM) Ultimate bipe and are easy to install (see the plans). I painted the gear and the pants with Rustoleum paint. The tail wheel is a CGM Klett .60-size unit that looks good and works well.

• **Covering.** I covered my Pitts with red, white and blue CGM Ultracote. This material provides very professional results with minimum time and effort. I copied the paint scheme from a real Pitts I had seen at an air show, but I used custom-cut decals for a personal touch. To prevent fuel from seeping under the covering, seal the inside of the engine cowl well. I used Rustoleum paint to match the covering color.

For power, I used a SuperTigre .90 2-stroke engine with a Master Airscrew* 14x6 prop. I fitted the engine with a J'Tec* Pitts-style muffler and a CB Associates* 3-inch-diameter spinner. A Du-Bro* 16-ounce fuel tank feeds the engine for plenty of flight time. I used an Ace R/C* MicroPro 8000 transmitter and the Pro 810 receiver to control the Pitts. Five Atlas* servos take care of the controls.

AT THE FIELD

The model weighs around 9 pounds ready-to-fly. Field setup is quick and simple and takes about 5 minutes. The bottom wing is attached with nylon mounting bolts, and the top wing is quickly screwed into place on top of the cabane. Simply attach the interplane struts and the aileron interconnecting pushrods, and you're ready to go. I hope that you enjoy your Pitts as much as I enjoy mine. Its size makes it easy to see, and its flight performance is very satisfying. The SuperTigre .90 provides plenty of power, but with a 1.20 in the nose, it would be awesome. If you want to try your hand at aerobatics with a scale-looking, IMAA-legal bipe, this Pitts is for you.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

BATTLE OF THE G

Blistering speeds break all-time records at *MADERA*

GIANT-SCALE RACING is all about speed and endurance—walking a tightrope stretched between horsepower on one side and structural integrity on the other. It does little good to have the fastest airplane in the world if the airplane can't survive the rigors of a week's worth of racing, and Madera '94 provided the ultimate proving ground for determining just who was best at walking the rope.

LANCAIR IV

The Lancair IV tightened its hold on the Unlimited class this year, outrunning the modified warbird contenders: Don Albright captured the championship with a 27.5-pound (dry) all-wood entry designed and built by Wendell Hostetler*; Harold Norfalise took third in Gold with his A-Cubed* twin-powered Lancair from D&W Aircraft*; Kent McKenna broke the all-time record with a lightning-quick, 29.87-second, two-lap qualifying time; and Mike Helsel was clocked on radar at 206mph into a 10mph headwind! The Lancair IV—although never a threat in the full-scale Reno races—is, in many ways, the ideal model racer. Its streamlined, teardrop fuselage and high-aspect-ratio wings enable it to

Left: balsa strikes again! With all of the emphasis on high-tech construction in giant-scale racing, it's nice to know that wood is still an option. This 27.5 lb. scratch-built Lancair IV was built by Wendell Hostetler from his own plans; A-Cubed 8.8 powerplant; flown to victory in the Gold by Don Albright. Lightweight airplanes with smaller engines may be the wave of the future.

Teamwork wins races! Classical Racing Team took first in Formula One Gold with Cosmic Wind from Paul Steiner—32 lb.; fiberglass fuse; balsa-sheeted foam wings; Webra 4.5.

NTS

by ROB WOOD

PHOTOS BY ROB WOOD

Determination is the password for Robert Heitkamp and crew. Alaska-based competitor is forced to fly off a beach to practice—while standing in the water!

"I get by with a little help from my friends." Robart's Bob Walker carefully inspects Dennis Crooks' Byron AT-6. Dennis—a super competitor in the scale world—switched to giant-scale racing and did very well in '94.

slip through the air with a minimum of drag. Add a generous dose of horsepower, put it into the hands of an accomplished pilot, and it is almost impossible to beat with a "heavy metal" warbird. That is not to say that the warbirds put in a shabby performance: Robert Heitkamp put on a tremendous show with his scratch-built, Aerrow* 200-powered Sea Fury, nailing down the second-place slot in the Gold; but the 20 extra pounds slowed him down in the turns and cost him the championship.

Other impressive warbirds included Rob Pastor's black Stiletto, Scott Manning's awesome Corsair and Dave Smith's 54.95-pound Best of Show Vendetta.

AT-6 RACES

AT-6 Texan racing took on a new twist this year with the elimination of qualifying rounds. All Texans showing up at Madera were guaranteed a minimum of three heat races, with finishing positions determining placement in one of five Silver or five Gold slots in Sunday's trophy races. Race organizer Lesley Burnett adopted the new format in response to widespread complaints from last year's T-6 race, when 100 airplanes registered and flew qualifying rounds, but only 40 were matrixed into the heat races. While ensuring that all entries competed, this year's three-heat format also meant that a single cut or a third-place finish in any heat dashed any hope of making it into the trophy races.

Jerry Rouillard—the AMA's new executive director—gets up close and personal with Team RPM's A-Cubed-powered Vendetta. Roger Grotheer flew the 34 lb. Unlimited contender to first place in Bronze.

Help! Somebody call 911! J.R. Wilbur's tongue-in-cheek race number and beautiful paint scheme was designed to attract sponsors—sort of an Unlimited mating ritual!; 35 lb. Kent McKenna kit; epoxy/glass fuse; foam wings sheeted with Obechi.

Lanier's Bubba Spivey won the AT-6 Gold trophy. Above: unaware that the race had ended, Bubba continued to duke it out with Perry Frolich until Perry's prop ate Bubba's elevator.

Lunch-time entertainment included a precision aerobatics demonstration; superbly built Ohio R/C Extra 300s was flown by Tom Easterday—co-founder (with Cliff Adams) of the Madera races.

Joe Marine, serious contender and kit builder, summed up the feelings of quite a few of the competitors: "It was a good idea, but it didn't work very well. We really need to go back to qualifying into Gold, Silver and Bronze—but only if those categories mean that the 15 fastest racers make it into the trophy races. We need a minimum of four heat races to determine the fastest airplanes—maybe more—and there are matrix programs available that will allow seven or more airplanes in each

Formula One

A proud builder, an excellent pilot and a great airplane. Cosmic Wind by Paul Steiner won every race it flew with Bryan Keil on the sticks.

A third giant-scale racing class was introduced this year: 42-percent scale Formula One. As is the case with AT-6 and Unlimited, Formula One aircraft must represent actual full-size aircraft that have qualified to race at the National Championship Air Races in Reno; and since dozens of different types of airplanes have competed over the years, the choice of subjects suitable for modeling is quite varied.

The rules at Madera differ from those at Galveston in that the maximum allowable engine size is 4.6ci, with a maximum airfoil thickness of 13 percent. Galveston split from the Madera rules by allowing a 6ci engine and a minimum thickness of 10 percent, because it was thought by many that the Madera rules would produce racers that would fly more slowly than the AT-6 class.

The truth is that the Texans at Madera reached top speeds of around 110mph, while the winning Gold Formula One passed the radar trap at 136mph—faster than some of the Bronze Unlimited racers. Because the original intent of the organizers of both races was to develop a class that would fall somewhere between the T-6 and Unlimited classes, I hope that the Madera Formula One performance will lay to rest the debate, and that the pilots, builders and manufacturers will see the rules standardized for '95.

Thirty-two Formula One aircraft were registered in this year's races, and all flew the same three-heat matrix as the Texans. Spectators were treated to some excellent racing by some of the top pilots in the sport. Top honors went to Classical racing team's Bryan Keil and his superb Cosmic Wind. The 33-pound racer, built from a Paul Steiner* kit, was powered by one of three Webra* Bully 75 engines to be introduced at Madera, and it consistently led the pack during the week's competition. Bryan joined several other Unlimited pilots—including Rick Maida, John Eaton and Duke Crow—in trying out the new class, and all seemed to be having a blast! Another team that did very well in Formula One competition was Pennzoil-sponsored Brian Nelson Racing, taking fifth and second in Silver as well as third in Gold.

Necessity really is the mother of invention! Joe Zimmerman hauls a D&W Aircraft GR-7 back to the pits after a hard landing damaged the gear. Joe went on to take first in Formula One Silver.

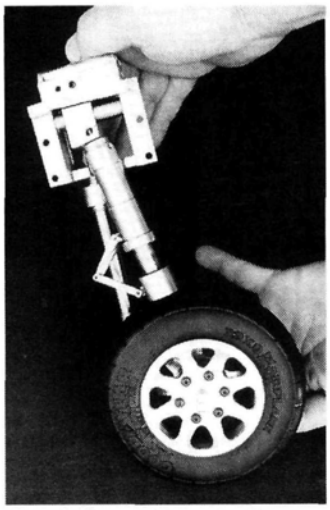
There are a wealth of interesting subjects for new Formula One class. Pushy Cat is a prototype kit from RacePro Engineering.

I predict that Formula One will be the most popular class of all, owing to the simplicity of fixed gear, allowable engine modifications and the wide variety of modeling subjects from which to choose.

heat. Both Ken Thornton and Mike Helsel have offered to supply the promoters with matrix programs, and I hope they take them up on it."

Lesley Burnett and the advisory board of Endless Horizons* will be tackling this ticklish problem in the months to come, but one thing is certain: AT-6 racing will continue to provide some of the tightest

Giant-scale racing is spreading across the U.S. and to other parts of the globe. France, Japan, Australia and Mexico were represented at Madera this year.



Revolutionary T-6 retracts were introduced by Conquistador Racing, Reno, NV. Gear features oil-filled Oleos that damp the shock on landing.

Diane Bailey with Rob "the kid" Pastor's model. Rob took fourth in Gold with this Aerrow 200 twin-powered Stiletto from a Sky Aviation kit.

and most exciting racing in the model airplane world.

"RE-KITTED" T-6 RACERS

One of the more ironic dramas in the T-6 arena was played out after the Gold trophy race: Bubba Spivey (flying a RacePro Engineering* Texan) and Perry Frolich (at the sticks of his Byron* AT- 6) had literally battled wingtip to wingtip throughout the race. Bubba crossed the finish line first, with Perry's T-6 right on his tail. The trouble was, neither of them knew the race was over. For some reason, there was no checkered flag to signal the completion of the race, and the two competitors were so wrapped up in the heat of the moment that they continued to rumble! As they rounded pylon 1, Perry's prop sliced into Bubba's elevator, and both airplanes "re-kitted" themselves—Perry's crossing to the far side of the field before going in and Bubba's T-6 diving nose-first into the hard-packed ground on the edge of the runway in one of the most spectacular crashes ever seen at the races. Bubba now has the distinction of being the first pilot ever to destroy his aircraft in the heat of battle after the race had ended!

You've got to build 'em strong. Mike Boso and friend demonstrate the concept with Mike's Formula One wing. "Kosmic Karen" was lost when an aileron servo locked in full deflection and Mike put the airplane in to protect flight-line personnel (a true sportsman!).

GLOBAL GIANT-SCALE RACING

Giant-scale racing is spreading across the U.S. and to other parts of the globe. France, Japan, Australia and Mexico were represented at Madera this year, and there was even a scout from Panama on hand to gather information for a possible race to be held in that country. In the past few months, MTV Sports and ESPN have taken an interest in race coverage, and it won't be long before this sport begins to reach the general public via the major networks.

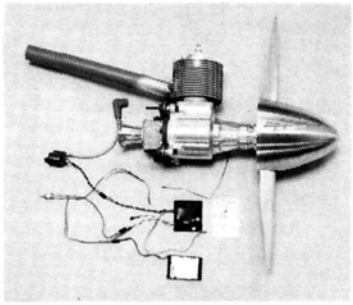
The "dog" was a Greyhound! Classical Racing Team's Bryan Keil proved that 4.6 cubic inches in a Formula One could provide the power needed to reach speeds between those of AT-6 and Unlimited ships. Webra rear-intake, rear-exhaust in a Paul Steiner Cosmic Wind took first in Gold.

If you've never been to one of these races, you're missing a major thrill. Most of the teams are hurting for support crew, so if you know of a team in your area, give them a call and volunteer to help. No mag-

Above: John Krohn builds beautiful—and fast—Sea Furys. Scratch-built from Roy Vaillancourt plans, the second-place Bronze 50-pounder sports an Aerrow 200 RSS twin; glassed wood construction; custom engine mount. Left: power to spare in a small package. Rodger Grotheer easily nailed the top Bronze trophy with an A-cubed twin-powered Vendetta. The full-scale Vendetta was a Lear Jet/Mustang Hybrid!

MADERA

The full-scale Nemesis (background) is the undisputed dominator of Reno Formula One racing; scratch-built from Wendell Hostetler plans by Ken Duck; Team Excalibur.



The new Webra 4.5ci, rear-intake, rear-exhaust Formula One engine debuted at Madera and took top honors in the Gold Trophy Dash. The 8.25 lb. powerhouse swings an APC 20x20 at 7,600rpm on gasoline.

WINNERS

UNLIMITED

Gold

	Team	Pilot	Race no.	Aircraft	Kit	Wt. (lb. wet)	Engine/Disp.	Fuel	Radio	Pr
1	Braun	Don Albright	68X	Lancair IV	Hostetler	27.5	A-Cubed/8.8ci	Glow	Airtronics	APC 22x
2	Red Dog Saloon	R. Heitkamp	–	scratch	Aerrow	47	198cc	Gas	Futaba	APC 23x
3	A-Cubed	H. Norfalise	885	DW	–	34	A-Cubed/8.8ci	Glow	Futaba	APC 22x
4	Pastor	Rob Pastor	126	Stiletto	Sky	40	Aerrow /198cc	Gas	Futaba	APC 22x
5	A-Cubed	Bill Cunningham	888	Stiletto	D&W Fuse	36	A-Cubed/8.8ci	Meth	Futaba	APC 22x

Silver

1	RWR	Dave Smith	28	Vendetta	Desert Aircraft	55	Herbrandson/280cc	Gas	Futaba	Zing
2	White/Lanier	Bubba	01	Sea Fury	DW	53	Herbrandson/280cc	Gas	Futaba	Zing
3	Mike Adams*	–								
4	White/Lanier,02	W. Vogles	–	Roto Finish	DW	40	Aerrow/198cc	Gas	Futaba	Bo
5	Braun	Ralph Braun	68	Stiletto	Ziroli	28	A-Cubed/8.8ci	Glow	Airtronics	

Bronze

1	RPM	R. Grotheer	444	Vendetta	Bridi	34	A-Cubed/8.8ci	Glow	Air	AF
2	Miller/Krohn	–	87	Sea Fury	Vaillancourt	50	Aerrow/198cc	Gas	Futaba	Zing
3	Bob & Tom	–	71	P-51	DW	46	5.8 twin/196cc	Gas	Airtronicst	22x
4	4 Star	–	3	Strega	KT Aviation	40	4-cycle/100cc	Glow	Futaba	20x
5	Rahm Racing	Randy Hill	06	P-51	Eaton	41	Villines/7.3ci	Glow	JR	AF

*No info. available

AT-6

	Team	Pilot	Race no.	Kit	Weight (lb.)	Radio
Gold						
1	White/Lanier	Bubba	01	RacePro	25	Airtronics
2	Bandit	Jack Thomas	6	Saxton	26.5	JR
3	AeroSport	Kelly Carter	120	Saxton	29	JR
4	Frolich	Perry Frolich	18	Byron	25.5	Futaba
5	Lockwood	John Lockwood	616	Saxton	25	Futaba
Silver						
1	Aerosport	K. Almendinger	691	Saxton	27	Futaba
2	White/Lanier	W. Vogles	02	DW	27	Futaba
3	Braun	Ralph Braun	68	Ziroli	25	Airtronics
4	Miller/Krohn	M. Helsel	15	RacePro	26	Futaba
5	OF&KWKIA	Ben McBride	611	Byron	34	JR

*Note: all fuel provided; all engines Zenoa G-62s; all props provided (APC 22x10).

OTHER TROPHY RACE STATISTICS

• SPINNERS

Unlimited: Tru-Turn—10; A-Cubed—2; Cermark—1; J&Z—1; Gene Barton—1.

AT-6: Tru-Turn—14; C.B. Associates—1.

Formula One: Tru-Turn—All.

• LANDING GEAR

Unlimited: Robart—13; Likes Line—1; Custom Electric—1.

At-6: Robart—13; Century Jet—1; homemade—1.

FORMULA ONE

	Team	Pilot	Race no.	Airplane	Kit	Weight (lb.)	Engine/Disp.	Fuel	Radio	Pr
Gold										
1	Classical	Bryan Keil	84	Cosmic Wind	Steiner	31	Webra/75cc	Gas	JR	APC 20x
2	White	Jim White	077*	–	–	–	—	–	—	
3	Nelson	Don Coulter	771	Cosmic Wind	Steiner	34	Aerrow/75cc	Gas	JR	Coul
4	Steiner	Paul Steiner	702	Cosmic Wind	Steiner	33	Sachs/4.2ci	Gas	Futaba	Zing
5	Eagle	Clay Cunningham	132	Nemesis	Horn Dog	33	Eaton/4.35ci	Gas	Airtronics	Zinger 18x
Silver										
1	Black Widow	Joe Zimmerman	717	GR-7	DW	26	Monster/4.4ci	Red Max	Futaba	APC 20x
2	Nelson	Rick Maida	111	Cosmic Wind	Steiner	28	Monster/4.4ci	Alky	JR	Coul
3	J&K	J. Eaton	52	Shoestring	Horn Dog	32	Eaton/4.4ci,	Gas	Airtronics	Zing
4	Old Crow	Duke Crow	70	Cosmic Wind	Steiner	27	Husky	Alky	Airtronics	APC 22x
5	Nelson	Babe Caltibiano	117	Cosmic Wind	Steiner	32	Aerrow/4.6ci	Gas	JR	Coul

*No info. available

"...no amount of spectating can give you the incredible feeling of camaraderie and challenge to be found working on a team and pitting your combined skills against the other teams on the flight line."

azine article can do justice to the excitement and intensity found at these races, and no amount of spectating can give you the incredible feeling of camaraderie and challenge to be found working on a team and pitting your combined skills against the other teams on the flight line.

The next confirmed race is scheduled for July 10 to 16, 1995, in Galveston, TX. Hosted by Hi-G Promotions*, the event will feature AT-6, Unlimited, Formula One and "golden age" racing. For more information, contact Wiley Brown at (713) 469-3388.

The next Madera race will be held during the last week of September or the first part of October, 1995. For more information, contact Lesley Burnett at (310) 320-8369.

Other races are under discussion for Florida, Phoenix, and the West Coast. Read *Model Airplane News* to keep abreast of breaking news.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

The Politics of Power

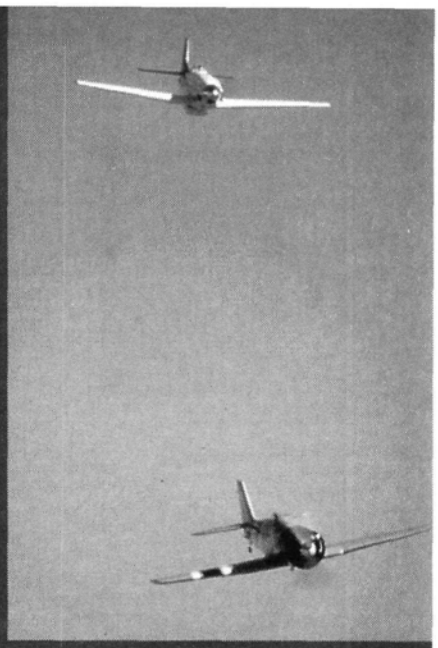
The big story in the Unlimited competition was the controversy over the Herbrandson* 280cc and 300cc engines. These drone engines develop 25hp (or more) and may represent the pinnacle of model airplane powerplants. Although the engines were plagued with fuel-flow problems, when they ran, they were incredible. Kent McKenna, for example, broke the qualifying record set earlier this year at half throttle. Even when the engines performed as expected, the airframes that held them seemed, on the whole, unable to hold together; one by one, they fell from the sky and were destroyed or damaged beyond repair.

Although top-qualifier honors went to Kent McKenna and his Herbrandson-powered Lancair, the winning Gold Unlimited airplane was a Lancair equipped with a Cunningham A-Cubed, 8.8ci twin on alcohol (the same engine that took first and second in Gold at Galveston '94). The 150cc A-Cubed also provided the horses for the third-place and fifth-place Gold entries.

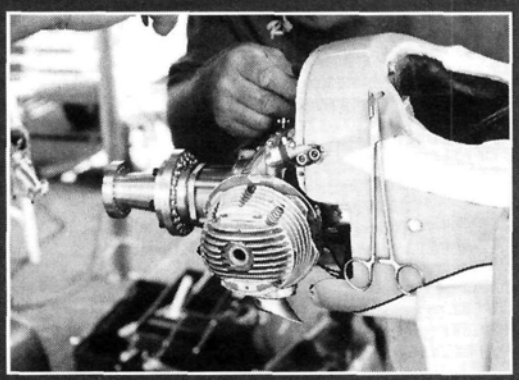
Second-place Gold was taken by a Sea Fury powered by an Aerrow 200, with the fourth-place Gold slot going to an Aerrow-powered Roto Finish. Finally, the top radar speed was taken by Mike Helsel, whose Aerrow 200-powered Lancair IV blew past the trap at 206mph "into the wind"!

In all fairness to Dean and Dale Herbrandson, it should be remembered that it took Klaus Nowak several years to successfully convert his Aerrow 200 into a dependable, trophy-winning racing engine, and that it was unrealistic to assume the Herbrandsons could waltz in and dominate the field in one fell swoop. Are these engines too much for our airframes? Maybe, but the truth is that it's premature to make such sweeping generalizations. After all, first-place Silver was taken by a Vendetta sporting a Herbrandson 280, and third-place Silver was won by a 280-equipped Sea Fury.

If two competitive aircraft could be built to handle the torque and vibration of these engines, isn't it reasonable to assume that 20 more could be engineered the same way? After this year's Reno R/C races, many people argued that a limit should be placed on Unlimited engine sizes; but it would seem to be more in keeping with the spirit of Unlimited racing to allow whatever limitations might be placed on engines to be determined by the rigors of the playing field and not by arbitrary decisions made by a rules committee.



Drag from the big frontal area of Robert Heitkamp's Sea Fury (bottom) doesn't seem to hurt too much. The 47-pound, scratch-built Unlimited took 2nd in Gold with an Aerrow 200 twin singing a 23x24 APC prop.

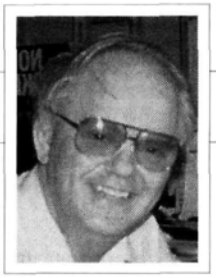


Herbrandson engines made a strong showing at Madera '94. The converted drone engines, which range in size from 216cc to 300cc, put on an awesome display of horsepower, but they hadn't been perfected in time for the races.

Below: Lanier's Bubba Spivey receives his trophy and a big check for his AT-6 Gold win. Unaware that the race had ended, Bubba continued to duke it out with Perry Frolich until Perry's prop ate Bubba's elevator.

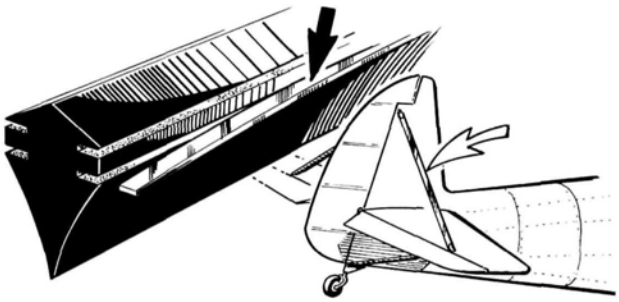
Right: sponsors with big names are beginning to take an interest in the sport. Chevron sponsored this 32 lb. Stiletto flown by Joe Reichlin for Ultimate Hobbies; 3W-120 twin on gasoline; kit from Ralph Saxton Glass.

HINTS & KINKS



JIM NEWMAN

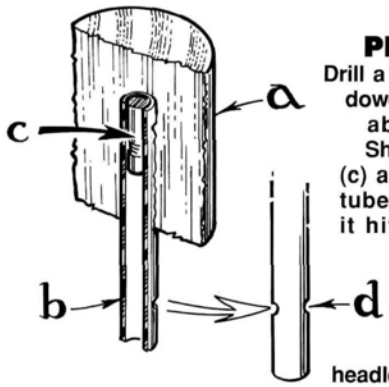
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



STREAMLINED BRACING

Collect old windshield-wiper blades and extract the narrow stainless-steel trim strips. Devise suitable end fittings, and you have realistic, streamlined, tail bracing.

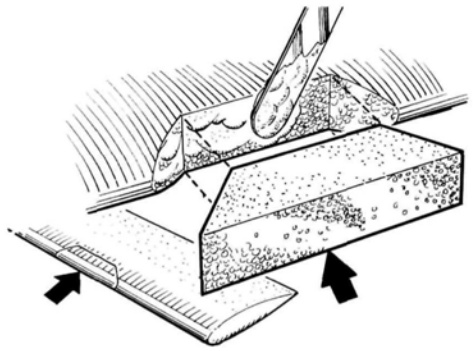
Stuart J. Ball, Burton-on-Trent, Staffs., England



PIN PUSHER

Drill a hole in a short, thick dowel (a) to accept a suitable brass tube (b). Shorten a finishing nail (c) and force it down the tube, cut end first, until it hits bottom. Insert a headless, heavy-duty T-pin into the tube, and use the pusher to force it into the board. The headless pins make it easier to remove frames, etc., from the building board. Crimping the sides of the tube at (d) will lightly grip the pins.

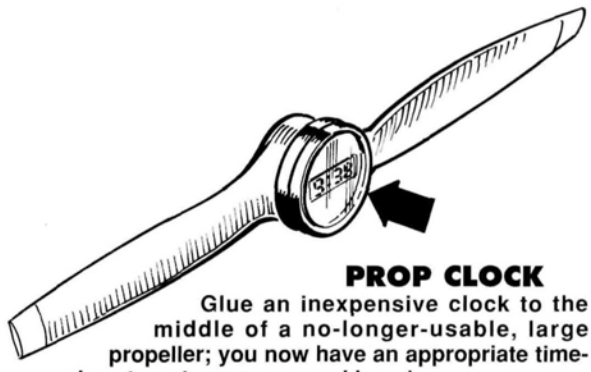
George Herrick, Henry, IL



DINGED FOAM-WING FIX

Neatly trim off the damaged foam to create a wedge-shaped recess, then cut a matching block. Lightly butter the recessed area with Hobbylite or Model Magic, then jam in the block, securing it with masking tape until the filler has set. The soft filler is an excellent adhesive, and it sands down as easily as the foam without leaving an unsightly glue line.

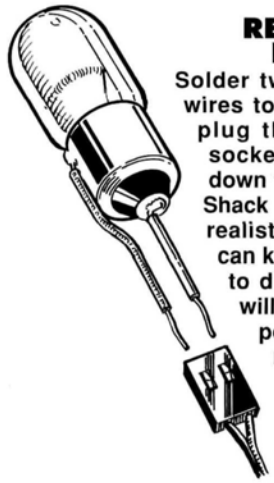
Larry Renger, Cerritos, CA



PROP CLOCK

Glue an inexpensive clock to the middle of a no-longer-usable, large propeller; you now have an appropriate timepiece to put over your workbench.

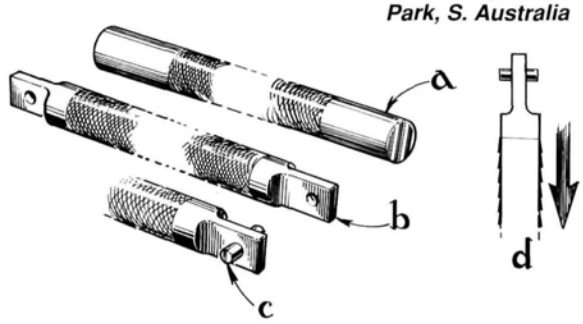
Dan Tadmor, Tivon, Israel



RECEIVER-PACK DISCHARGER

Solder two stiff, insulated, copper wires to a small bulb. After flying, plug the wires into the charge socket or battery pack to run it down to 1.1 volts per cell. A Radio Shack no. 272-1108 bulb applies a realistic 250mA load so that you can keep track of the time it takes to discharge your battery. This will give you some idea of the possible flying time or safety margin remaining in the pack. (Instead of the two bare wires suggested, why not solder a matching plug to the leads?)

Michael Johnson, Wattle Park, S. Australia



MULTI-DIRECTION SAW BLADE

Fitted into your Dremel saw, this blade will cut many materials in any direction—quickly. Made out of a 0.155-inch-diameter (4mm) chainsaw file (a), the ends were annealed (by heating them to a cherry-red and cooling them slowly) before grinding the flats (b) and drilling holes for the wire cross pins (c), which should be spaced the same as with your regular saw blades. Retain the pins by center-punching or by peening the ends. When annealing, clamp a vise around the file, near the heated area, to act as a heat sink. Install the file so that it cuts on the down stroke (d).

Laurence C. Simms, Baltimore, MD

FIELD & BENCH REVIEW

A 2-meter, easy-to-fly ARF sailplane

THUNDER TIGER Windstar

PHOTO BY WALTER SIKORA

The author displays Thunder Tiger's new Windstar—one of the most complete two-meter sailplanes on the market. Quality materials and easy construction make it a pleasure to build and to fly.

by FRANK MASI

WE LIVE IN a world that demands instant gratification, and we see a proliferation of prefabrication, even in the hobby industry. I think this is wonderful. There will always be those for whom the construction process is equally—if not more—gratifying than actual flying; but to many, the faster a model goes from box to flying field, the better. In this spirit of speedy assembly, here's a look at the Windstar, an ARF (almost ready to fly) sailplane from Thunder Tiger USA*.

The Windstar is designed for quick assembly and stable performance for the novice to intermediate flier. It's a rudder and elevator ship that comes 90-percent assembled and can be controlled by any 2-channel, aircraft-frequency R/C system. Traditional sailplanes such as the Windstar are not powered, so they must rely on their designs—and the skill of their pilots—to achieve long-lasting thermal or slope-flying duration. For this reason, sailplanes have high-lift airfoils and very light wing loading, both of which are characteristic of the Windstar.

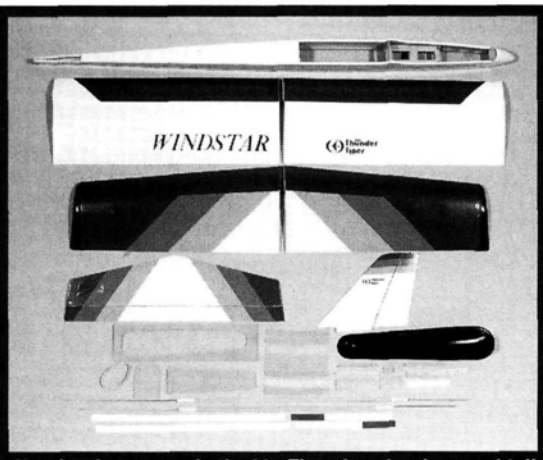
Although the Windstar is a true ARF ship, there's still some minor building involved. As with any model, care taken during assembly will pay dividends when it's time for that crucial first flight; and it will provide an overall pleasant experience.

WING ASSEMBLY

The Windstar's 77-inch-span wing has a polyhedral design that uses a flat-bottom airfoil that looks similar to the Clark Y. It consists of four panels that must be epoxied together. The panels have balsa ribs and a traditional D-tube design that uses an upper and lower spruce spar. The leading edge and the root section are sheeted with 1/16-inch-thick balsa, and the leading and trailing edges are formed of solid balsa stock. All four panels come covered with an attractive white-plastic film that has yellow, orange and red accent stripes.

SPECIFICATIONS

Model name: Windstar
Type: 2-meter ARF sailplane
Manufacturer: Thunder Tiger USA
Wingspan: 77.3 in.
Wing area: 574 sq. in.
Wing loading: 8 to 9.7 oz./sq. ft.
Weight: 32 to 39 oz.
Length: 44½ in.
No. of channels req'd: 2 (rudder and elevator)
Radio used: Hitec Flash 5
Airfoil: flat-bottom, sport-type
Wing construction: balsa ribs and sheeting; spruce spars
Kit construction: balsa, ply, spruce; molded nose and canopy
List price: $114.99



Here's what comes in the kit. The wing, fuselage and tail are pre-built and covered. A molded-plastic canopy and nose cone, plus all the necessary hardware, are also included.

Comments: a quick-to-build (about four hours), 2-meter sailplane that has a high-quality balsa, ply and spruce construction; attractive, pre-covered fuselage, wing and tail surfaces; hardware and linkage are included (including a tow-hook for high-start launching); can be hand-launched, high-started, slope-soared, or thermal-soared.

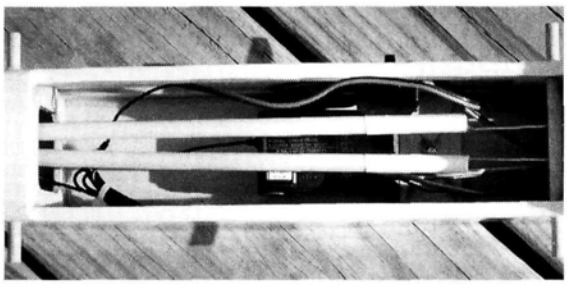
Hits
• High-quality materials and construction. • Strong, well-designed wing. • Complete kit with well-detailed instructions. • Easy assembly; can be flown in a matter of hours.

Misses
• Additional nose weight required to achieve proper balance.

The inner (non-tapered) panels are joined first. A wing-joiner brace (two lite-ply plates that sandwich a sturdy aluminum plate) strengthens the joint and ensures the proper dihedral angle of the inner panels (roughly 2 degrees). The brace is designed to slip into the "box" that's formed by the spars and webbing of each panel, and it should be trial-fit before the epoxy is even mixed. I used Pacer's* Z-Poxy to liberally coat the brace and the end of each panel, then I pushed the pieces together and held them tightly until the epoxy set.

The outer wing panels are tapered, and they join the inner panels at a dihedral angle of about 3 degrees. They're epoxied to the inner panel assembly and are held in the proper position by a lite-ply brace (made of three pieces of plywood epoxied together). It's especially important that you trial-fit this assembly; make certain that the braces fit snugly, but not too tightly, and lightly sand them if necessary. Molded-plastic wingtips come already attached, and they look as though they're quite durable.

Thunder Tiger supplies self-adhesive film tape to cover the seams between the wing panels. This makes the finished wing much more attractive; the tape is even colored to match the design on the pre-covered wing panels.



The Hitec receiver couldn't be placed in the desired position (see text). Its rearward placement necessitated additional balancing weight.

FUSELAGE AND TAIL

The Windstar's box fuselage is made of 6mm-thick balsa (sides, deck and bottom) and has lite-ply formers. In several areas, material has been milled away from the insides of the sides for lightness. The fuselage comes completely assembled and covered; all you have to do is add the stabilizer and fin/rudder. The fin is of solid balsa; the stab has conventional stick construction. The rudder and elevator are hinged to the fin and the stab, but you must glue them permanently together (best done after the fin and stab have been glued to the fuselage).

The first thing you do is trim the leading

DOUBLE M ELECTRONICS

Fatcat II

R/C sailplanes are capable of sustained flights that last hours; for this reason, it's important that the battery pack is in top condition. Here's a look at one device that's designed to enhance the battery's life and performance.

The Fatcat II from Double M Electronics* is a digital battery analyzer and conditioner that automatically discharges, quick-charges and then trickle-charges your batteries. The Fatcat II is actually two units in one that can condition both your receiver batteries and transmitter batteries at the same time. Each side of the unit has its own clock circuit to show the discharge time displays. It's these time displays that allow you to accurately determine the health of your batteries.

IMPORTANCE OF CYCLING

Analyzing—or cycling—batteries is simply measuring how long a battery pack will last at a specific discharge rate. The Fatcat II keeps a log of discharge times to monitor a battery's working capacity. If you notice a decrease in working capacity (shorter discharge times), you can take steps before a problem occurs.

Cycling battery packs will also prevent them from developing any "memory," which is a premature drop in battery voltage that's caused by repeated charging of an only partially discharged battery pack.

HOW TO CYCLE

Cycling batteries is accomplished by discharging a

The wing panels feature all-wooden construction: balsa ribs and sheeting and spruce upper and lower spars. The wing-joiner braces are inserted into the "box" formed by the spars and webbing.

edge of the stab so that it fits flush in the saddle. I found the instructions a little vague for this step, and I ended up trimming off a bit too much material. Remove the radius of the LE and no more.

You now have to carefully remove the covering material from all the surfaces of the stab that contact the fuselage to ensure a strong glue joint between the parts. During this procedure, I noticed that on page 7 of the instructions, step 2 shows an incorrect photo; it should illustrate the removal of the covering from the fin slot, but instead, it shows the removal of the covering from the underside of the stab where it will contact the stab saddle (step 5). It was no big deal, but it took me a second to figure out what was going on. As the instructions warn, and as I reiterate, you must take the greatest care to avoid scoring the underlying balsa when you slice the covering, because doing so will weaken the wood.

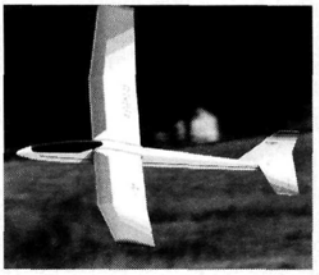
After checking the fit of the fin, you must remove the covering from both the fin and the fuselage where the two will contact each other. You do this—as with the stab—to ensure a good glue joint. Epoxy the stab to the fuselage first; it must be absolutely perpendicular to the sides, and it must be perfectly centered. Before the epoxy set, I taped a small, draftsman's, 90-degree triangle to the side of the fuselage, under the stab, to ensure proper alignment.

When the glue on the stab has set, attach the fin. A large tab on the lower portion of the fin slides into a slot in the fuselage to provide a strong connection. To ensure that the fin was perpendicular to the stab, I taped my triangle to the fin and to the top surface of the stab while the epoxy was setting.

Holes in the fuselage allow easy installation of the wing hold-down dowels. You need only to remove the covering that's over the holes and then use Zap to secure

FLIGHT PERFORMANCE

• Takeoff and landing



The first voyage of the Windstar took place at the FLYRC field in Southbury, CT. Expert flier and "Simple Programming" columnist Dave Baron was on hand to put the ship through its paces. Launches were achieved through the use of a high-start. As a safety precaution, the first few launches were done with low tension. The Windstar launched with wings level, and it rapidly gained altitude. When we were familiar with its flight characteristics, we really stretched the bungee cord and sent the plane to an altitude of several hundred feet. Dave was able to gain even more altitude when he pushed the high-start's tension during launch by adding up-elevator more liberally in subsequent launches.

Landings are basic belly landings, so it's recommended that you fly over a soft, grass field, if possible. On several occasions, Dave was able to fly the Windstar directly into his left hand (show-off!). After six or so landings, the underside of the fuselage showed no signs of damage or wear.

• Slow-flight performance

If level flight is achieved, the ship will glide gracefully, and quite slowly, owing mainly to its low wing loading. Straight-ahead glides are the best way to attain longer flight times because any variation in course will cause a marked loss of altitude. A long tail-moment arm permits the smallish rudder and elevator to exert considerable control over direction; only minute movements are necessary.

• High-speed performance

High-speed performance for sailplanes is dictated by the strength of the ship's structure. Before the last launch, Dave grabbed each wingtip and flexed the structure; he pronounced the Windstar as having an "impressive, strong wing." I wasn't sure why he did this until he dove the ship nearly straight down from about 250 feet. He pulled it up in a large, graceful loop at about 40 feet. Needless to say, the wing held up well.

• Aerobatics

Sailplanes are not renowned for their aerobatic capabilities; during the Windstar's limited, deadline-induced flight time, however, Dave was able to perform a fairly tight loop after a speed-increasing dive.

---

fully charged battery pack until it's empty, measuring the discharge time, then fully charging the pack again. For accurate results, remember that the battery pack must be fully charged to start with. Also, the discharge rate must be constant and shouldn't vary with the decreasing pack voltage. Finally, the discharge must be cut off when the voltage per cell reaches 1.1. The Fatcat II does all this automatically, so you can simply plug in your battery packs and walk away. There is no guesswork involved.

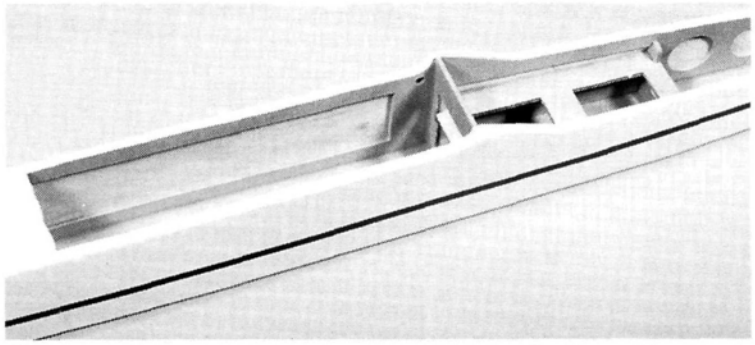
USING THE FATCAT II

The settings for voltage and capacity switches on the Fatcat II work for most commonly used battery packs; you must be sure to select the proper settings before you begin cycling. Slight variations are OK, i.e., charging a 500mAh pack at the 550mAh setting, or charging an 1100mAh pack at the 1200mAh setting, but grossly mismatched combinations should be avoided.

The batteries should be fully charged before accurate cycling can begin. The Fatcat II has an automatic, fail-safe, "Charge only" mode that switches from fast-charge to trickle-charge after 4½ hours. Switched to the cycle mode, the unit will automatically keep track of the charge rates. The unit monitors each step of the cycling procedure, and colored lights indicate what the charger is doing (red for discharge, yellow for quick-charge and green for trickle-charge). The actual capacity of the battery can be calculated when the discharge light has gone out. The battery's actual capacity is equal to the discharge time multiplied by the discharge rate, and then divided by 60 to convert the time from minutes to hours because batteries are rated in milliamp hours. The specification sheet that's included with the Fatcat II provides all the necessary information to obtain your battery's actual capacity; all you need to do is add the discharge time. Safety first!

—Gerry Yarrish

the dowels in place. A metal tow-hook is provided, and you should install it if you plan to launch the Windstar with an elastic high-start. The hook is routed through the bottom of the fuselage through two lite-ply plates, then secured with a washer and nut. To strengthen this critical, high-stress area, I used *plenty* of Z-Poxy when I assembled the plywood plates, and I formed a CA fillet around the nut and washer with Zap-A-Gap.



The square-sided fuselage is made of 6mm-thick balsa sheeting and has lite-ply formers. Note that some material has been milled away from the inside to save weight. The plywood radio tray comes installed.

The final part of the fuselage assembly is adding the injection-molded nose cone. It's held to the front former with self-tapping screws, and it looks beefy enough to withstand many nose-first landings.

CANOPY

The Windstar achieves part of its sleek, good looks from its one-piece, black-polycarbonate canopy. The canopy is supported by a lite-ply frame, and it's held in place by a rubber band that's attached to a small, brass hook that's installed on the inside of the fuselage.

In the instructions, the canopy frame is shown as one piece with scored ends that are "folded" up to become formers for the canopy. In my kit, I found three separate pieces: the canopy frame and two formers. To build the frame, I aligned the pieces on the fuselage then used small drops of Zap to "freeze" them into position. After I had removed the pieces, I cemented the assembly using a bead of Zap-A-Gap on both joints. Once dry, the frame is CA'd to the inside of the plastic canopy, then the canopy is trimmed along the lines of the frame. I glued small pieces of ¼-inch-square balsa to the bottom of the canopy frame to key it to the fuselage opening.

CONTROL SURFACES AND LINKAGE

It's a good idea to install the control horns before you attach the solid balsa rudder and elevator. The kit includes nylon horns that are mounted with two screws and a nylon backing plate. The hinges that attach the rudder and the elevator must be glued into place. I used 5-minute Z-Poxy to do this because it allows enough curing time to insert all the hinges and finesse them into position. When I had them in place, I wiped the hinge joints with isopropyl alcohol to remove any excess epoxy that would otherwise bind the hinges. Applying light oil to the hinge pin before you apply the adhesive will also help to prevent binding.

The elevator and rudder are controlled by two, pre-assembled dowel-and-wire-type pushrods. One end of each rod is threaded to accept a screw-on clevis, the other must be cut to length and given a Z-bend. The elevator rod exits straight through the rear of the fuselage, but the rudder rod must exit the side of the fuselage, and it must be bent to meet the control horn.

I mounted two Hitec* HS-422 servos on the Windstar's plywood radio tray, and I installed the radio switch on the side of the fuselage, just under the wing, so it can be activated without removing the wing or cowl. The full-size, Hitec FM/HFD-08RD receiver was too large to fit between the tow-hook plates and the pushrods, so I had to mount it farther back than was recommended. This meant that there would be more nose weight than I had anticipated. I had to mount the flat, 4-cell, AA Ni-Cd pack that came with my Hitec Flash 5 radio in an upright position in the nose. I centered the pack, then made an upper brace out of cardboard to keep it in place. (A square pack would fit better and could be mounted farther forward.)

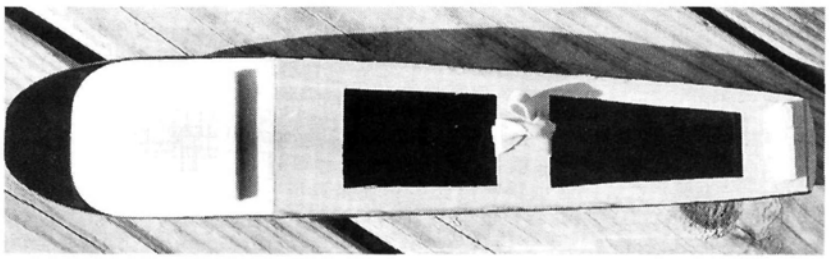
PREPARING FOR FLIGHT

The control-surface throws for the Windstar are as follows: elevator—½ inch travel in either direction; rudder—1½ inches in either direction. The model should balance at a point that's 2½ inches behind the wing's leading edge, next to the fuselage. To achieve this, I had to add a considerable amount of lead weight to the ship's nose. I attribute this to two things: the receiver's size prohibiting proper placement, and the flat configuration of my battery pack. I'm sure that if these conditions were corrected, much less weight would be needed to balance the ship properly.

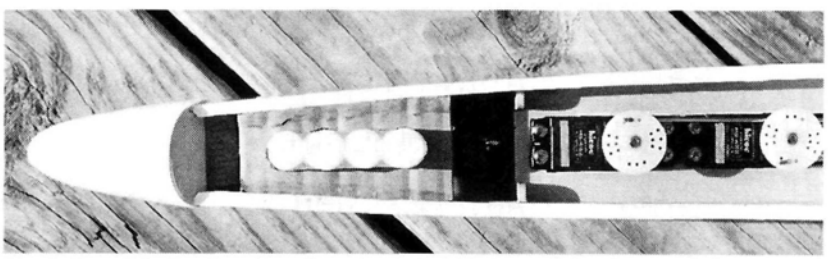
SUMMARY

Thunder Tiger USA has done an admirable job with the Windstar. It's a complete kit with excellent instructions. Although it took me a little longer to build than the four hours that its manufacturer claims it should take, the assembly went smoothly. There's a good safety margin built into this ship, provided that it's constructed properly and is balanced. During its first flight, almost no trim corrections were needed for stable, straight and level flight. Novices and intermediate fliers who are in the market for a high-quality, ARF, 2-meter sailplane should give the Windstar serious consideration.

* *Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■



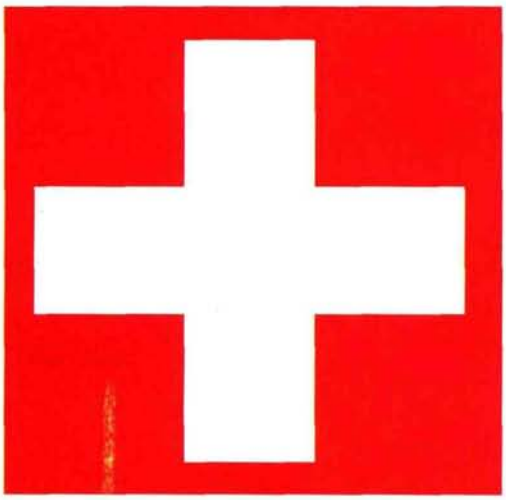
Fitted with a lite-ply frame then attached to the fuselage with a taut rubber band, the black, one-piece, molded canopy gives the Windstar a sleek, modern sailplane look.



Front view of the fuselage that shows servo installation and the placement of the battery pack. For balance, lead weight was placed in front of the battery. The lite-ply radio tray comes installed.

A Swiss master modeler demonstrates another way of thinking

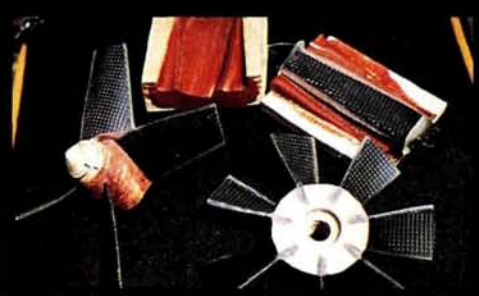
Above: at takeoff, the big BAe 146 could be easily mistaken for the real one. The gyro on the aileron channel helps damp roll movements—a big help for any scale model. Left:Hans Bühr and his giant-scale BAe 146 electric jet airliner. Such an impressive size, and it flies on only four small 05-size motors! Below: even from a close view, the polystyrene foam fuselage outer shells look realistic yet are extremely light. The molded turbine blades can be seen inside the shrouds.



Giant scale with only four .05 can motors?!

Hans Bühr uses homemade ducted fans that comprise a central pod linked to the outer shroud via six stator blades, which strengthen the airflow past the impeller. There's an advantage over combustion engines: the round motor case can easily be included within the central pod, and no protuberance impedes the airflow. Minimal vibration allows a relatively simple mounting system.

The fan is made of a plywood hub on which are glued five carbon-fiber and epoxy-resin molded blades. Molded blades are the only way to achieve a good aerodynamic as well as static and dynamic balance. More unusual is how the mold has been made. Hans Bühr used



Left: the center frame joins the rear and front triangular fuselage structure. Notice how the battery is held against the spruce central frame and kept in place with a couple of rubber bands.
Right: you can see here two 4x5.5-inch fans made from the process devised by Hans Bühr, and the simple mold made using only a rubber-power propeller and a mixture of epoxy resin and microballoons. The finished blades are simply glued onto a wooden hub. Weight balance is essential, of course, but aerodynamic balance is made easier by the accuracy of all the blades.

Hans Bühr's Giant-Scale, Electric-Powered Jet Airliner

by GUY REVEL

FOR YEARS NOW, enterprising modelers have experimented with electric-powered jet models using commercial or—more often—homemade ducted fans. Quite a number of such models fly in Germany and Switzerland. One of the most impressive of the models I have seen was made by Hans Bühr, an airline pilot by profession and exceptional electric scale modeler by gift. His latest masterwork is a scale model of a BAe 146-200 airliner, of the type that flies regularly in the Swiss skies.

The British Aerospace 146-200 short-haul airliner, nicknamed "Jumbolino" (small jumbo) or "Flüsterjet" (buzz jet) for its exceptionally low noise level, is in current use by the Swiss regional airline Crossair to take 82 passengers to small, noise-sensitive airports of this mountain country.

Like many if not most Swiss modelers, Hans Bühr specializes in electric power. Some of his creations have already earned him considerable respect from the modeling fraternity. Among his earlier models was a giant-scale Pilatus Turbo-Porter VTOL aircraft, complete with a scale working reverse-thrust prop mechanism for very short landing use, and one of the very first electric ducted-fan models—a small MiG-15 fighter that still flies impressively. His BAe 146-200 project was much more ambitious. It uses four 7-cell, 05-size Mabuchi BB VZ motors (for a total of 28 Ni-Cd cells). These are "can" motors of the type also used for cars. With this seemingly reduced power, the scale airliner spans all of 90 inches, so that even with its very modest power, the red-and-white ship can be considered a giant-scale model by any standard. Here is how the ingenious Swiss modeler proceeded and succeeded in creating a most realistic model.

A DIFFICULT SUBJECT

When you consider the scope of this project, you may think that his goal—a four-jet airliner—was somewhat out of reach, especially when you know what miserable thrust you usually obtain from almost scale electric ducted fans driven by ordinary 7-cell motors. But Hans Bühr is not somebody to shy away when difficulties arise. In fact, the Jumbolino was to include such scale essentials as landing flaps and a retractable undercarriage.

Above: close-up of the wing and the flaps. The stick atop the center of the wing is a holding device to check the CG location before flight. Left: on a landing approach, flaps fully extended and gear down. One can notice here the rather complex scale flap action, going rearward as well as downward.

The project required use of a light structure throughout. As a bonus, the light flying weight would increase the speed, owing to reduced induced drag associated with the lower wing incidence necessary to lift the model. Landings would also be easier with less fear of a dangerous and vicious stall. As with any flying model, the chances of a long life increase dramatically when the weight and wing loading decrease. The reliability of electric motors (no "one-engine-out" scenarios) would further work to increase the model's longevity.

So most of the design work was in defining the proper light structure. Hans Bühr planned, from the outset, to use Mabuchi RS-540 VZ motors with seven cells per motor. The Sanyo 1400 SCR Ni-Cd cells offered the best

SPECIFICATIONS

Type: scale BAe 146-200 airliner

Power: four 05-size Mabuchi BB, RS-540 VZ motors running on 28 Sanyo 1400 SCR Ni-Cds, and turning four custom-made 4x5.5-inch impellers

Wingspan: 90.5 in.

Flying weight: 180 oz. approximately

Wing area: 990 sq. in.

Wing loading: 26 oz./sq. ft.

Construction: balsa, poplar, lite-ply, composite materials

as an original master plug a commercial plastic propeller manufactured for small, rubber-powered models, and it proved ideal for the purpose: the mold could be open at both ends, and only a fraction of the original blade length was effectively used. The fan diameter is 4 inches, with a maximum blade width of 0.95 inch and a 5.5-inch pitch.

Experimentation was necessary to find the ideal blade angle with best thrust. Each fan runs at 15,000rpm and delivers a static thrust of 24.2 ounces with a current drain of 28 amps. This maximal thrust is used only during the takeoff; cruising flight is done at barely half power, so that the current drain is well within the capability of the motors, and there is no danger of overheating.

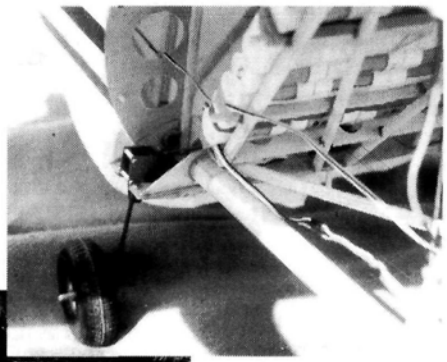
The four fan units are wired in series with a single 28-cell battery and a custom-made speed control. The front fuselage cover is removed for battery access. As is normal practice in Europe, the battery is taken out for cooling and is charged between flights.

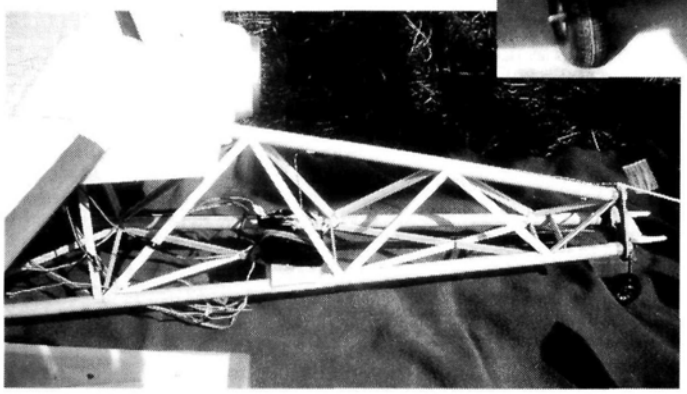
compromise between nominal capacity and actual delivered power at high (for ferrite magnets) current drain.

The impeller system had already been developed by Hans Bühr and needed only to be adapted to the specific requirements of the planned flying speed and the pod design (neither inlet nor outlet ducts; these are real power-killers in any ducted-fan system). A simple weight analysis gave the following results: the battery weight for the four power units was to be 51 ounces, and the power system, consisting of the four ducted-fan units and the necessary speed control, was an additional 38.8 ounces. This yielded a total power-system weight of 90 ounces. A rule of thumb says that the total flying weight should be very nearly double that weight, so approximately 180 ounces could be expected for the complete model.

This first result led to the final size definition. A wing loading of approximately 26 ounces per square foot was considered an upper limit to prevent nasty stall characteristics. It was then easy to compute the desired wing area as approximately 990 square inches.

The BAe 146 was first publicly flown at the 1992 Militky Cup in Switzerland. Since then, it has been flown at many meets in Switzerland and in nearby countries. It always impresses the spectators.





In this other view, one sees clearly the plywood frame bottom and the retractable landing-gear fixture. A normal landing-gear mechanism for pattern models is quite sufficient for this giant-scale model, thanks to the low total weight.

How to build a very light model with a very light frame. The three balsa tubes are braced with an incredibly light balsa spar structure, thus making the fuselage extremely rigid and strong.

To further improve flight performance (by keeping the wing chord within reasonable limits for aerodynamic purposes), the original wing aspect ratio was reduced, and that led to a 15 percent increase in the scale wing chord. This had an added benefit: the model wing's thickness was increased, thereby reducing the structural weight for the required strength. This way, the final wingspan came in at 90.5 inches, producing a large model indeed for such modest power. The fuselage was also narrowed a little bit, reducing overall drag and final weight. To increase performance without destroying the scale look, the scale impeller's diameter was very slightly increased to improve the efficiency and provide more thrust.

ORIGINAL THINKING AT ITS BEST

The structure itself is made almost entirely of thin (1/64-inch) plywood (poplar plywood wherever minimal thickness was necessary) and selected balsa wood. Add to that a few glass and carbon reinforcements and the clever use of all these materials. Just as an example: some plywood was handmade of very light balsa glued with CA so that the necessary parts still had enough compression strength.

The optimal structural strength was obtained by extensive use of triangular and geodesic elements (torsion-resistant), closed-box elements and tubes. The large wing uses only two thin balsa spars reinforced with carbon fiber and joined with vertical-grain balsa webs to make an I-beam of considerable strength. The fuselage structure itself is a real masterpiece. It is centered around a nearly vertical main frame made of a lower plywood plate holding the retractable landing gear and its servo, and, secondly, an upper wing holding platform. These two parts are joined by a geodesic structure of poplar ply and birch stringers.

This central frame holds the front and rear fuselage frames, which are again triangular structures with two lower and one upper longeron. These longerons are rolled balsa-wood tubes, 1/32 inch thick and 0.6 inch in diameter, covered with lightweight glass cloth and linked to the central frame. Again, a geodesic structure of balsa strips holds everything together. "What relationship has this structure with the scale fuselage?" you may ask. And you would be right. The fuselage is carved and sanded of light polystyrene foam and covers the working structure. The rear section is glued in place, while the front part is simply pushed over the structure and gives access to the radio and the power battery. The outer shape is carefully sanded to a smooth finish and filled with light water-based sanding sealer. The final paint coat is done with light water-emulsion colors.

The front structure is securely glued to the central frame so that the complete landing-gear unit and wing-support frame are firmly held together. The rear structure (bearing the tail unit) is held only by three screws and can be easily disassembled. The disassembled model can fit in the smallest car! The wing and tail construction is almost entirely conventional. Because the landing gear and battery pack are both mounted on the fuselage structure, the landing loads supported by the wing are

restricted to those generated by the mass of the power pods (they each weigh a modest 8.8 ounces) and the wing structure itself.

The wing is built in three parts. The central section includes the four power pods and the scale-like flaps with their command servo. A microswitch at the flaps' lowest position also operates the working landing lights. The outer wing panels each include a mini-size aileron servo, which is sufficient for full efficiency, thanks to the low aileron weight and moderate flying speed.

CONVINCING FLIGHTS

The big BAe 146 has been demonstrated on many occasions in Switzerland and in nearby countries. The effect is incredibly impressive. On a concrete surface, the takeoff run does not need more than 100 feet, and the climb is dramatically realistic. As soon as a safe altitude has been reached, the power is reduced, and the big jetliner seems to cruise effortlessly at an incredibly scale-like speed. Even the soft buzz of the electric turbines contributes to the overall impression.

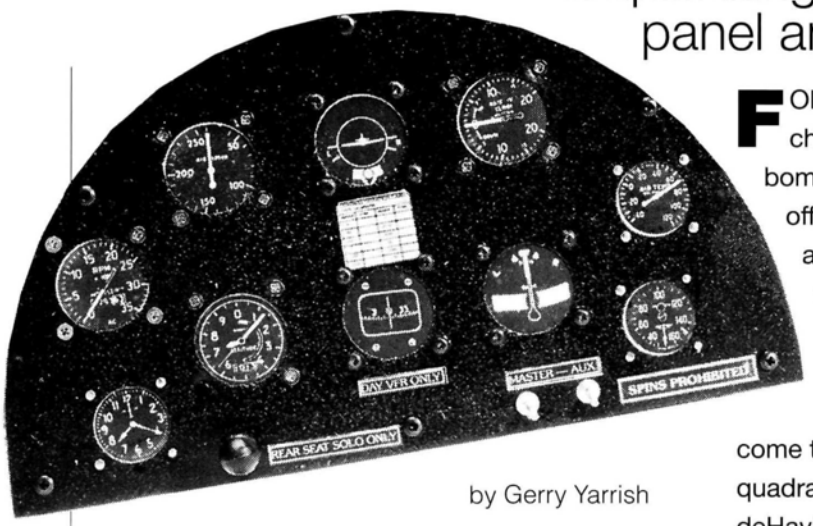
Whereas noisy, high-pitched engines are said to impress spectators with their power, the "sudden silence" of an electric model doing a large aerobatic pattern or streaking through at high speed produces the magical effect of suddenly keeping all spectators quiet and incredibly impressed. Such is the effect produced by the remarkable model flown by Hans Bühr. To damp the reactions of the aircraft to control inputs, as is normal for a jet airliner, he even added a gyro on the roll axis in spite of the added weight. The result was well worth the trouble.

The Jumbolino is but one of the scale electric models we can admire every year at European meets like the Militky Cup in Switzerland. Electric ducted-fan models are increasing in popularity but are, in fact, completely different from their engine-powered brothers. Their realism is incredible, and they are much easier to build and fly. If you can build light, you will find that there is none of the difficulty associated with high-revving, nitro-thirsty engines, nor the related costs. Motors and batteries seem to last forever, as do the models, which do not sustain the vibration level of aircraft powered by reciprocating engines—provided, that is, you do not shorten the life expectancy of such models with pilot error! ■

HOW TO

Make Scale Cockpit Details

Duplicating the instrument panel and throttle quadrant

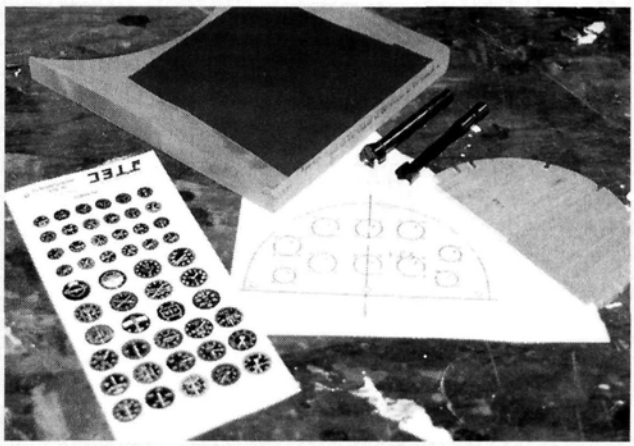


by Gerry Yarrish

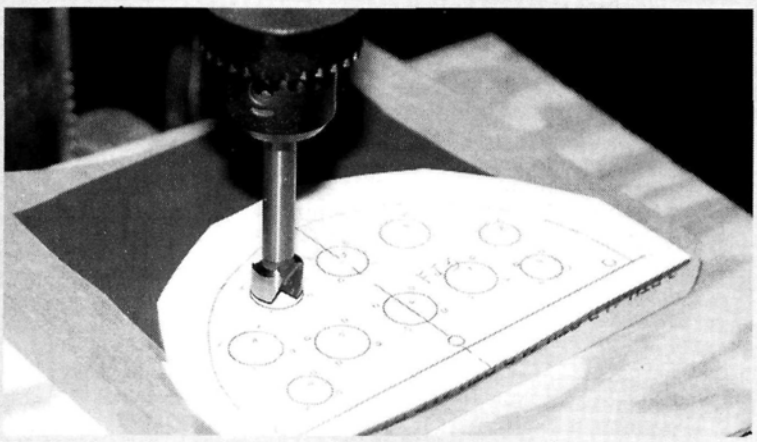
FOR MANY scale modelers, the most problematic chore when building a scale model—fighter, bomber, or civilian aircraft—is decorating the main office—or cockpit. On the flight line, you'll often see a beautiful scale model that has loads of external details, and there's no question that the modeler did his homework. Stepping a little closer, you peer into the cockpit and the illusion ends. Two easy-to-build details that will make your cockpit come to life are the instrument panel and the throttle quadrant. Here's how I made them for my WW II deHavilland Chipmunk trainer.

Good-looking details are not acheived by accident; a lot of documentation needs to be done first. Assemble photos and/or drawings of the cockpit that you plan to build, and try to simplify what you see. The trick isn't to duplicate every single detail, but rather to decide which details are the most important and then focus on them.

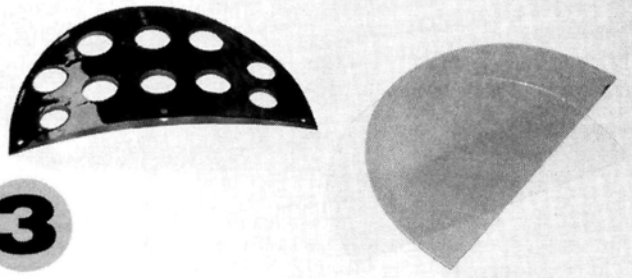
1 **To make the instrument panel, you'll need instrument faces (I use J'Tec*), thin plastic, wood or sheet aluminum (for the panel face) and fly cutters (Forstner bits) that are the same size as the instrument faces' openings (in this case, 5/8 and 1/2 inch). You begin by drawing (on paper) the plans for your panel, which will be located on the model's bulkhead. Make sure that you include all the openings, switches and screw positions.**



PHOTOS BY GERRY YARRISH

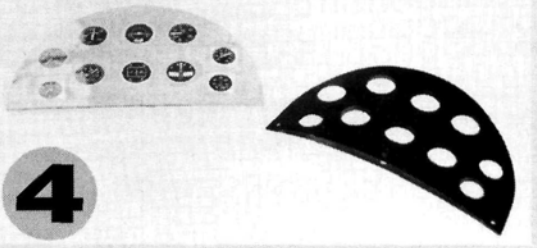


2 **Use spray adhesive to tack down the panel material (I use 0.015-thick prepreg fiberglass sheet) to a piece of wood, and then attach your instrument panel drawing on top of that with more spray adhesive. Carefully drill out each opening (I use a drill press with the fly cutters). Notice that I have marked the positions of all the attachment screws for each of the instrument faces. You can drill the holes out now, or you can simply center-punch them and install the screws later.**



3

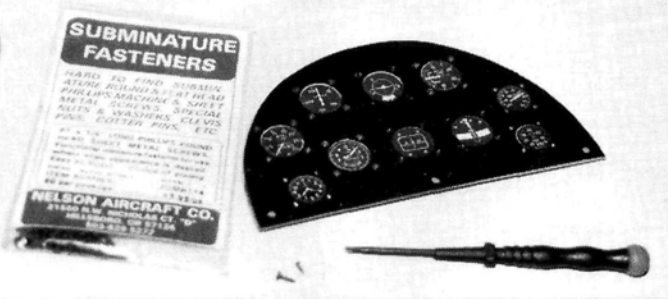
After you have drilled all the instrument face openings, cut the panel to size while it's still tacked to the wood. (I used a band saw with a fine blade and then sanded the edges smooth.) When the panel has been cut, carefully peel it off the wood and clean the adhesive off it with paint thinner or mineral spirits. Now trace the panel outline both onto a backplate that has been made out of 1/16-inch plywood and onto a piece of clear 0.015-inch-thick plastic; cut out these two traced parts. Next, spray paint the panel with an appropriate color. I used flat black "non-skid" paint to obtain a krinkle-like finish.



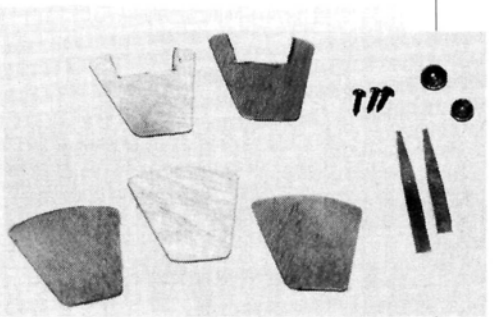
4

Cut out the instrument faces and use ordinary, clear tape to secure them onto the plywood backplate. Hint: put the panel face on the plywood and trace a pencil line around the instrument holes to mark their positions; then remove the panel face. Once you're satisfied with their positions, spray the plywood face with a very light coat of spray adhesive and press the clear plastic onto the instrument faces. The adhesive is almost invisible and will not show through the face openings.

5



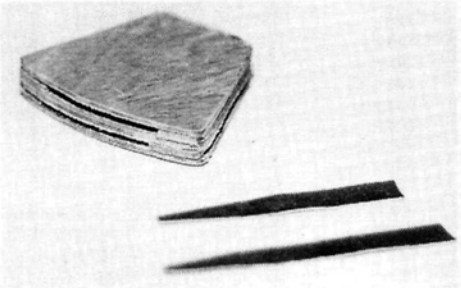
Finally, flip the panel over, spray the back with adhesive, then position it over the instrument faces and press it firmly into place. Use a thick book to weight down the assembly for a few minutes until the adhesive has dried. This ensures that the finished panel will be flat. Now you can add the screws, the switches and other small details. I use Nelson Aircraft Co.* subminiature screws as the bezel screws and the panel-mounting screws. Use a thumbtack to punch holes in the panel, and then install the screws with a small screwdriver. The opening photo shows how I used some placards that I had made on my Macintosh PC. I made the toggle switches by using the cut-off tips of thumbtacks, which I glued into the slots in the heads of small cap-head screws and painted them silver. Straight pins can also be used as the bezel screws, as shown in the three smaller instruments.



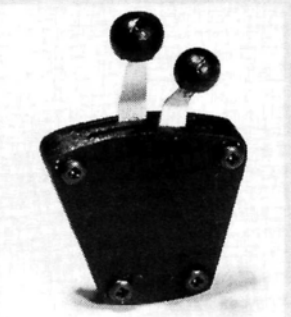
6

I get more comments about the little throttle quadrants that I install in my scale cockpits than I get about any other detail I make. Here are the few parts you need to make a twin-control quadrant: five pieces of 1/32-inch-thick plywood cut to the outside shape of the quadrant; some miniature screws; two small plastic beads from a child's necklace; and two thin strips of aluminum that have been cut as shown.

7



Stack the thin plywood plates as shown, and glue them together with thin CA. Notice the openings formed between the layers by the notches that have been cut into the second and fourth layers. These are the track openings that the "aluminum levers" are glued into. Drill a small hole in the two plastic beads, insert the tapered ends of the aluminum strips into the holes and glue them with medium CA.



8

Sand the plywood-block quadrant to its final shape and paint it flat black. Drill holes in the corners of the quadrant and install the small Nelson subminiature screws. Paint the plastic beads black. Bend the aluminum levers as shown, and glue them into the track slots with thin CA. The larger knob is the throttle and, depending on the aircraft that you're modeling, the smaller knob can be the mixture-control knob (painted red) or pitch control for the prop (painted green).

It's very easy to make small-scale cockpit details. When they're put together, they make your cockpit come to life and add a lot of realism to your finished model. Apply these simple steps to your next model; you'll be glad you did. ■

FIELD & BENCH REVIEW

ALTECH MARKETING

Beechcraft Musketeer

by Vic Olivett

A great flying sport-scale giant

ALTECH'S BEECHCRAFT MUSKETEER almost-ready-to-cover kit was designed for experienced R/C modelers who wish to enjoy the realism of giant scale. The model is a sport-scale replica of the low-wing, civilian aircraft that was introduced by Beechcraft in 1961 as the Model 23 Musketeer. In 1974, the Musketeer was renamed the Sierra 200, Sundowner 180 and Sport 150 series of aircraft. You can build the Musketeer with the fixed landing gear provided or, if you prefer, you can install a retractable landing-gear system.*

THE KIT

When the kit arrived, I could not believe the size of the box. On inspecting it, I was pleasantly surprised at how much of the model had already been built. The massive, 72-inch-long fuselage arrives built, sanded and just about ready to cover. The foam-core wing and tail feathers come already sheeted with falcata—a wood that's native to the Philippines—which is used throughout the kit. The one-piece cowl is made of fiberglass; the side windows are pre-cut and bordered to ensure a good, tight fit.

CONSTRUCTION

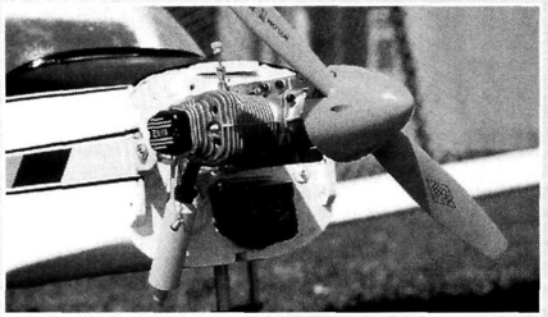
After looking over the kit several times, I decided that this plane just had to have flaps and retracts. I chose the Century Jet Models* (CJM) ¼-scale tricycle-gear system because it's one of the best I've seen in today's market. Bruce Sanders of CJM helped to set me up with the right system for this project. The rugged gear is guaranteed for one year. CJM will custom cut the Oleo struts for your specific installation.

As with all my other projects, I found that Pacer Technology*, with its wide assortment of adhesives—including Zap—has the right product for every type of construction. The last thing I want to worry about is whether the glue will be strong enough.

The fuselage is slotted to accept the tongue that's built into the fin. This allows a good, snug fit and ensures correct alignment. The dorsal fin is epoxied to the fin, but be careful not to glue the fin or the dorsal fin to the fuselage at this time. Trial-fit the horizontal stab into its slot in the fuselage; trim or sand as needed, but maintain a snug fit. Once you're satisfied with the fit, drill the hinge holes in the rudder and elevator and install the hinges. Do not glue the hinges or the stab parts until final assembly.

WING

Because I had decided to use CJM retracts, I had to measure each wing panel for the retract installation. I did this by using the fixed gear that was provided with the kit. I marked the exact point at which the strut forms a 90-degree angle with the bottom of the wing. I then cut two 4x4-inch squares of ¼-inch-thick aircraft ply; later, I attached the retracts to these. I used the squares as templates to cut the bottom of the wing. After I had removed foam to make room for the plates, the gear and the wheel well, I drilled four ⅜-inch holes in each plate (one at each corner). I then cut four 1½-inch-long pieces of ⅜-inch dowel. I glued the plates with Zap and used the dowels to pin the plates into the wing.



The Enya R120-4C 4-stroke engine powers the Musketeer very well. Notice the lead weight attached to the firewall below the engine. Enya R120-4C specifications: 2.1hp; rpm range—2,500 to 13,000; weight—32.04 oz.; displacement—1.20ci/19.9cc; prop size—13x9 to 15x8; also available in a pumped version—the GP 120 4-C.

To make the channels that go from the wing root to the retract for the air lines, I used a piece of ¼-inch brass tube that I had heated with a torch. I cut the inboard third off each aileron to use as the flaps; the aileron torque rods in the kit work well. I thought it would be best to use one servo for each aileron, and I mounted them TOC-style just in front of the ailerons. This allows me to use short pushrods instead of bellcranks.

The wing is joined with two large dowels that fit into oversize holes. Fill the holes with Z-Poxy, cover the entire wing roots with epoxy and join the wing panels. Wipe the excess epoxy off the joint and hold the panels in place with masking tape until the epoxy has cured.

When the wing has cured overnight, epoxy the plywood plate and the trailing-edge torque-tube blocks into place. This is a good time to install the plywood servo plates for the flaps.

Check the alignment of the wing with the fuselage. When you're satisfied that the wing is properly aligned, screw the wing bolts from the inside of the fuselage and through the mounting blocks, until the ends of the bolts just touch the wing. Mark the spots where they touch the wing, and then drill the bolt holes in the wing. Bolt the wing into place over the saddle, but only finger-tighten the wing bolts. Insert an awl or pencil point through the two holes in the fuselage bulkhead at the leading edge of the wing, and mark the position of the wing dowels.

Remove the wing, drill the ⅜-inch holes for the dowels, epoxy the dowels in place and let the glue cure. Wrap the entire center section with the fiberglass cloth that's supplied with the kit, and saturate it with Zap.

FUSELAGE

As I said earlier, most of the work on the fuselage is completed at the factory. But, because the Musketeer is designed for fixed gear that's mounted on the firewall, and because I decided to install the CJM retracts instead, I had to design and build a mount for the nose gear.

Vic holds the Musketeer to show its huge size. The Century Jet Models retracts handle the 21½-pound load with ease.

To increase strength, I added fiberglass cloth to the front end of the plane. I then installed a hardwood plate on the firewall and two ¼x1-inch rails that ran from the firewall plate back to the instrument bulkhead. To install the gear, I cut a 4-inch plywood square and then bolted it to the rails. This will allow the nose gear to be removed easily if it ever requires service. With this type of installation, you'll have to build a wheel well for the nose gear, and the bottom fuse plate will have to be cut to allow the nose gear to retract.

This is a good time to install the air lines for the retracts. CJM offers an optional restricter valve that controls the airflow to each gear. This makes for a nice effect on

SPECIFICATIONS

Model name: Beechcraft Musketeer
Type: giant sport scale
Manufacturer: Altech Marketing
List price: $425
Wingspan: 96 in.
Wing area: 1,248 sq. in.
Length: 71¾ in.
Weight: 15 lb. (advertised); 21½ lb. (as flown)
No. of channels req'd: 4 to 6 (rudder, elevator, aileron, throttle; optional flaps and retracts)
Engine used: Enya R120-4C 4-stroke
Fuselage construction: built-up wood
Wing construction: foam-core

HITS

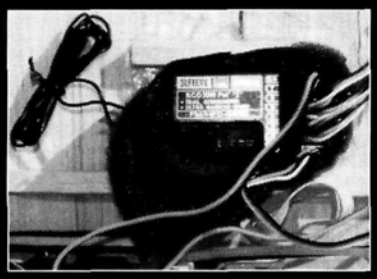
- Good flight performance; very stable.
- Comes almost ready to cover.
- High-quality components.
- Easy-to-manage size.
- Excellent hardware package.
- Easy-to-follow instruction manual.

MISSES

- The falcata wood is more difficult to sand than balsa.
- Overall weight of finished model exceeded manufacturer's specs, in part, because of the installation of the flaps, retracts and the 2.5 pounds of nose weight required.
- Lack of instruction for cabin construction.

Don't Try This!

When we first flew the Musketeer, we made a mistake that usually only newcomers make. After a couple of flights, we opened the radio com-



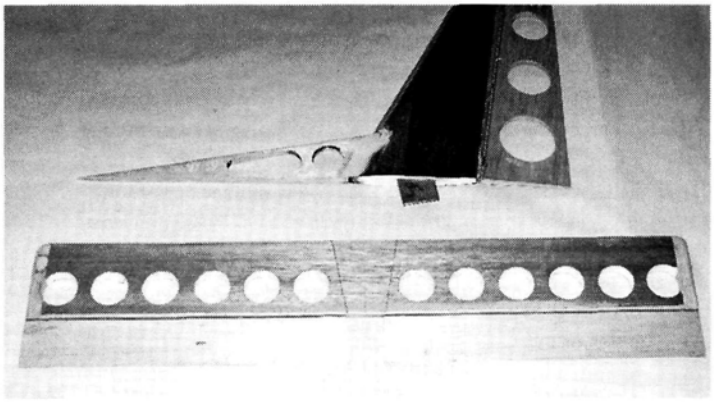
Don't try to fly your model like this! We forgot to unwind the Hitec Supreme receiver's antenna, but didn't realize it until after we had flown the model. Even in this worst-case example, we had full control without a single glitch! Wow!

partment only to discover that the antenna hadn't been uncoiled and stretched through the fuselage! Imagine flying a plane this large—one that a pilot easily flies out a good distance, given its generous size—without uncoiling the antenna. The caution has always been to avoid clipping even an inch off an antenna because that can weaken its sensitivity to the signals that it's supposed to bring into the receiver.

Experienced modelers know that even doubling an antenna back on itself can severely reduce its range and put the model at risk. Yet we had left the antenna tightly coiled, just as it was in its original packing. This is quite a testament to the capability of this Hitec/RCD Supreme 3200 8-channel receiver—performance that speaks for itself.

The model arrives almost completed. The fuselage is built-up wood, and the wings and tail are sheeted foam.

scale projects, and it can be adjusted after it has been installed in the plane. Another new feature from CJM is the 32ci aluminum air tank.



The tail parts are big and ready to cover; lightening holes keep the tail's weight down.

The engine that's recommended for the Musketeer is an Enya* R120-4C. You should install it on a good-quality aluminum mount and bolt the mount to the firewall. Mounting the engine on its side works well, and it allows the exhaust to run out through the bottom of the plane. The large, fiberglass cowl hides most of the engine. A 15x8 prop with a 3-inch spinner finishes off the front end nicely.

For the finish and the trim, I used Coverite's* 21st-Century fabric. I've used it on most of my projects for the past few years, and I've found it very strong and durable; it's also easy to work with and it looks great. Coverite also offers matching paints for cowls and wheel pants.

I used easy-to-install Century Jet Models retracts, which perform really well.

RADIO INSTALLATION AND FINAL SETUP

Because of the size of this monster, I decided to use ¼-scale servos for the rudder and elevator. This is doubly necessary because the rudder servo also controls the nose-gear steering cables for the retract. The airborne pack consists of a Hitec/RCD* Supreme 3200 8-channel receiver and Hitec HS-700BB and HS-300 servos (a total of nine servos!). For safety, I thought it best to use a 1700mA battery pack; and my transmitter is a Futaba* 6- channel.

When I had finished the assembly and installation, I checked the CG and found that the plane was tail-heavy. I placed the battery pack and everything else as far forward as possible, but I still had to add 2½ pounds of lead to the firewall. I began to have doubts that this thing would even get off our grass field. I wondered whether the flaps and retracts were a bad idea because of their weight.

FLIGHT PERFORMANCE

• Takeoff and landing

The first takeoff of this monster was a little scary. We have a 600-foot runway that runs north to south, and this big plane used just about all of it.

The Musketeer tracks very well, and the Enya R120-4C has the power necessary to fly it. When the Musketeer lifts off, there's a big increase in speed, and then the 120 really starts to show off. The climb-out is strong and will keep you on your toes. This airplane is not slow. At the start of your first turn, you're already at pattern altitude. The plane has rock-solid, smooth approaches, soft, gentle landings and a very short rollout.

• High-speed performance

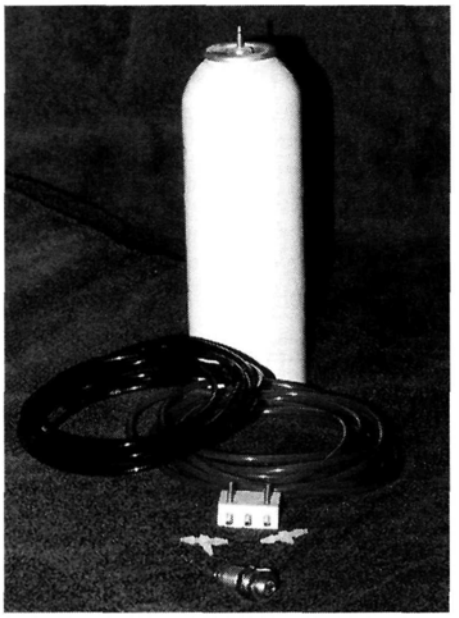
When you pull the CJM retracts up into the wells and go to full power, this plane is fast, especially for a 21½-pounder. The high-speed low passes are fast, exciting and impressive. The model has no bad habits, and it doesn't require trim changes when the gear retracts.

• Low-speed performance

Because I didn't know just what to expect with regard to stalls, I made sure that there was plenty of space between the plane and the ground. Whether the gear was up or down, or whether the flaps were up or down, stalls were very gentle and straight forward at a surprisingly slow speed, and recovery was easy. The plane did require a slight nose-up trim change when the flaps were applied.

• Aerobatics

After I had centered the trim on the elevator, I tried some simple loops and rolls. Both maneuvers were very clean and the Musketeer tracked very well. Snap rolls were quick and easy to recover from, and inverted flight was easy and stable; I must admit that it did look a little strange to see this big bird flying upside-down. I didn't attempt any spins or knife-edges.



CJM offers all the support equipment needed for their retracts. Here are the air lines, fittings, valve and storage tank. There's more than enough room for the retracts.

PREFLIGHT

The day of reckoning arrived—a beautiful Sunday morning, with light winds right down the center of the runway. My first order of business was to run a few tanks of fuel through the new Enya R120-4C. Yes, I know, I should have done this on the bench. But who has time?

The Enya ran as though it had been through 10 hours of break-in. I did the final radio and engine checks, and we were ready to go.

The Musketeer taxied as though it owned the field, but I still didn't believe that this 21½-pound monster would get off the ground. I did a few high-speed runs, and when the plane started to get light on the gear at about halfway down the runway, I knew it was ready. I topped off the 16-ounce tank, taxied the plane to the end of the runway and turned it into the wind. One more final check of the controls, and power up.

CONCLUSIONS

So, there you have it. After building and flying R/C for over 25 years, you'd think I'd be able judge a model. Well, when I finished this project and took to the field, I never thought it would get off the ground; not only did it fly, but it did so very well.

If you're looking for a giant-scale, easy-to-build, fun-to-fly project, at a reasonable price, the Altech Musketeer is the way to go. If you decide to make this a scale project, Jeff Troy of Altech can supply you with copies of Beechcraft photos and any other help you may need.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

FIELD & BENCH REVIEW

IN JULY 1985, I had just returned home from a giant-scale event sanctioned by the International Miniature Aircraft Association (IMAA). I was hooked! I needed a giant-scale warbird *fast,* but which kit should I buy? The Byron Zero looked good; the ad says it's a complete kit with most of the goodies included. And so my relationship with Byron Aircraft* began. Since 1985, I have built all the Byron prop-driven aircraft and a few of their jets. The time and money invested was well-spent on these projects.

PART 1

BYRON AT-6 TEXAN

The completed Byron AT-6 Texan ready for painting.

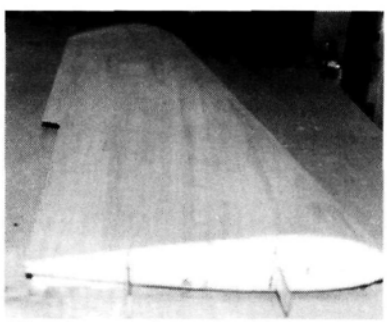
by FRANK PONTERI

A classic 1/5-scale "Pilot Maker"

BYRON ORIGINALS

If I were to write a history of giant-scale model aircraft, Byron Godberson and the company he founded—Byron Originals*—would certainly figure prominently. They became involved early on and played a major role in promoting giant-scale aircraft with the Striking Back Air Show and Fun Fly, which were originally held annually at the company's factory in Ida Grove, IA. The event still attracts modelers from all over the world, as does the IMAA Rally of Giants, which Byron hosted in '82 and '83.

The production of a Byron Originals kit is not a quick process. After the decision has been made to produce a particular aircraft, the project is turned over to the two Kens—Ken Bundt and Ken Bryant. They design the kit, and using the Byron building methods, they produce the prototype. This aircraft is then test-flown at the factory, and any necessary improvements are made. (I know *a lot* of time was spent on the AT-6 landing-gear mounts.) They then demonstrate the capabilities of the finished prototype at various fly-ins, and if you see either Ken at an event, you can be sure you'll get the straight scoop on any Byron product.



The wing panels for the T-6 have wire-cut foam-cores, and they're sheeted with balsa. Here, the completed wing panel has the aluminum joiners already installed and ready for joining to the wing center section.

COMPLETE-KIT CONCEPT

When Byron introduced its first kit, the Pitts Special, they also introduced a new idea in kit production—the complete-kit concept. Byron kits come with all the wood and hardware needed for completion; you supply glue, paint, radio, retracts and engine(s). With the exception of the radio, all are available from Byron and are matched to the aircraft.

Byron kits fall into four types of building techniques. The all-foam kits are the Pitts Special, Christen Eagle and Cap 21. All the other kits come with fiberglass fuselages and foam wings. Two types of foam-core are used. The P-51 Mustang has molded-foam wings, and the AT-6 Texan has wire-cut, foam wing-cores. The new Byron Gee Bee has a fiberglass fuselage and a built-up wooden wing.

Much of the same hardware is used in all the kits, but the special hardware for each kit is different. The engine is mounted in the same way in all the fiberglass-fuselage kits, and there are a number of custom mounts available to fit all the recommended engines. As you can see, once you have built one Byron kit, you will be familiar with the building process of all of the kits in that category.

THE MIGHTY TEXAN

The basic kit includes: a two-part fiberglass fuselage, wire-cut fin and stab foam-cores, decals, a spinner, six numbered bags of hardware, pushrods, a fuel tank, control linkages, a canopy, die-cut formers, fiberglass cloth to install the formers, foam rubber (used in the radio installation), hinges and all the wood needed to complete the construction. The 24-page manual contains 96 photos plus detail sheets.

To complete the construction of this kit, you'll need:

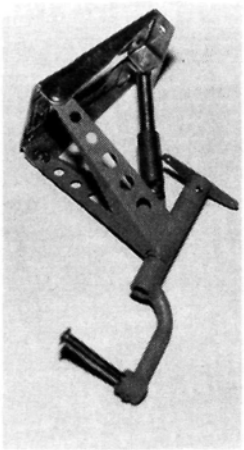
- retracts—Robart* AT-6 no. 161;
- pneumatic support equipment;
- 5¼-inch-diameter tires and hubs;
- engine mount.

To assemble the Texan, I used:

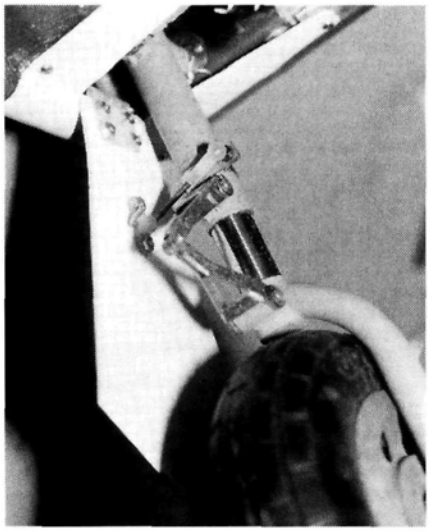
- Sig's* polyester resin and Epoxolite epoxy putty;
- Bob Smith Industries* thick, medium and thin CAs and 5- and 30-minute epoxy.

BUILDING THE WINGS

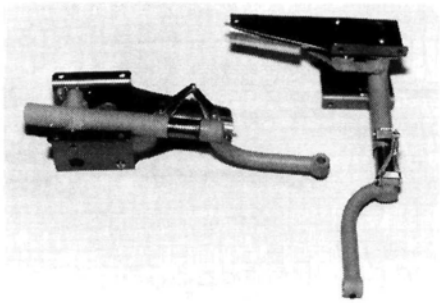
Construction begins with the wing cores, which must be completed *first* so that you'll be able to install the fuselage formers in the proper positions later. Correctly installing the wing spars and fuselage formers is crucial to the final success of this project. Take your time, and *read the manual*!



I also used a Robart tailwheel unit in the Byron T-6 model. Its installation requires that a new rear fuselage former be made and installed in a different location than the kit's stock former.



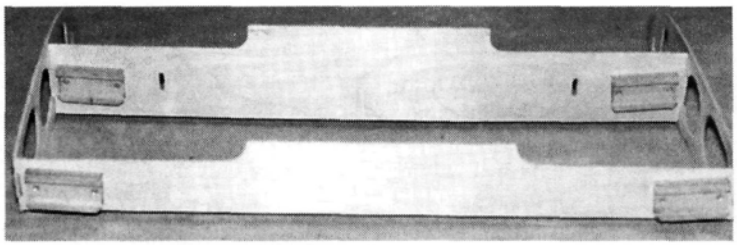
The completed retract installation is neat and very strong.



I used Robart T-6 retractable landing gear in my model, and they drop right in.

Using the wing-construction drawing as a guide, epoxy one aluminum spar into each of the ⅛-inch-thick, die-cut spar formers (use 30-minute epoxy). When the epoxy has dried, sand the wooden area of each spar (the part that will go into the wing core) with 80-grit sandpaper. Then drill a few ¼-inch holes in them to ensure a better glue bond when the spars are installed in the foam-core. Using 30-minute epoxy, install the completed spars in the wing cores. Cover the foam sleeves with wax paper to prevent them from being bonded to the cores while the glue is drying. The ¼-inch spruce spars can also be installed at this time. Weight the cores down on a flat surface while the epoxy is curing.

Next, prepare the balsa skins for the cores. I made up the stab and wing skins at this time. Being familiar with the Byron building method, I like to cover my wing and stab cores at the same time, as this will save a little time later. I use a glue available from Abel Hobby & Mfg*. Two thin coatings of this glue are applied to the core and skin and allowed to dry overnight. The skin is then applied while the core is resting in its sleeve on a flat surface. The stab cores are sheeted in the same way at this time.



These are the plywood parts that are glassed into the wing's center section of the fuselage. Note the wing attachments are already installed.

After the skins have been applied to the cores, trim and sand the skins flush to the cores. The wing leading and trailing edges and tip blocks are now installed. Sand to approximate shape as per the drawings.

FUSELAGE CONSTRUCTION

At this point, we are ready to begin construction of the fuselage. I also work on the tail feathers during this time while I'm allowing adhesives used in the fuselage construction to cure.

Wipe the interior surface of the fuselage clean with a cloth saturated with denatured alcohol. Make all of the necessary cut-outs in the fuselage, and clean off the dust and debris. Prepare the fuselage formers for installation, and trial-fit all the formers into the fuselage. Note: fuselage construction steps 1 through 8 *must be followed in sequence*. I used Sig polyester resin and the 6-ounce fiberglass cloth supplied with the kit to secure all of the formers in place. Sand the area in which the formers are to be installed with 80-grit paper, and clean it with denatured alcohol prior to installing the formers. It's necessary to trim the top of the fiberglass wing cuffs to allow the wing to slide into place. Go slowly and remove a little material at a time.

LANDING GEAR INSTALLATION

After all the wing-panel attachment work has been completed, you're ready to install the retractable landing gear. I chose Robart's 161 gear set that's specially

SPECIFICATIONS

Manufacturer: Byron Originals
Model name: AT-6 Texan
Type: ⅛-scale warbird
Wingspan: 101 in.
Length: 71.5 in.
Weight: 25 to 30 lb.
No. of channels: 6 (elevator, rudder, aileron, throttle, flaps and retracts)
Fuselage construction: fiberglass
Wing construction: foam-core
Power req'd: 3.7 to 4.2ci
Engine used: stock Zenoah G-62 (required for air races)

List price: $564.95 (kit only)

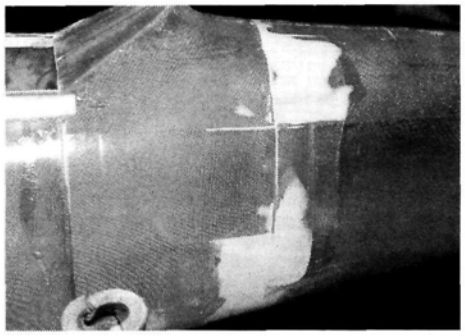
HITS

- The hardware package was more than adequate to build the model.
- The building sequence in the manual worked well, and the detail sheets had the additional information needed to complete the model.
- All of the parts supplied fit well.

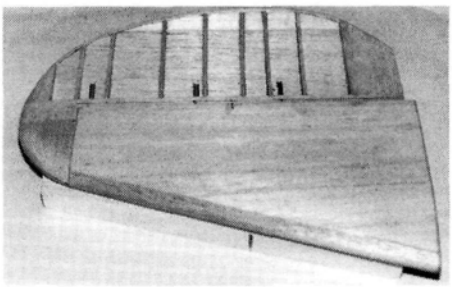
MISSES

- The parts for the tail feathers all have to be made of balsa stock using the tem plates provided. I would expect factory-cut parts in a kit costing this much.
- A choice of canopies should be available.
- Hand-cut plywood parts in place of die-cut parts would be nice.

Comments: the Byron AT-6 is a good value for the time and money invested. This model has won a number of national air races, and it has been a favorite at many giant-scale fly-ins. It's recommended that you have some "big bird" building experience before building this kit. If this is your first giant-scale aircraft, get help with the building and flying.



I joined the fuselage halves and filled in the seam with filler.



This is one of the finished horizontal stabs and elevator assemblies that will later be mated to the spars already installed in the tail of the fuselage.

designed for the AT-6 Texan. It's important to trial-fit the gear onto the landing-gear mount blocks before you epoxy the blocks into place. Once you're happy with the way everything fits, epoxy the blocks into the formers and, when the epoxy has cured, reinforce all the parts with fiberglass cloth. Reinstall the landing gear, and attach the Byron wheels to the axles. Check to see that the wheels fit properly into the wheel wells with the gear in the retracted position, and trim the wheel-well opening, if necessary, for a neat, clean fit. Adding the plastic landing-gear covers and the gear doors completes the installation. The air lines are installed after the model has been completely painted.

FINISHING UP THE FUSE

I joined the two fuselage halves according to the instructions, and I filled the seams and pinholes.

As mentioned earlier, the tail feathers were completed during fuselage construction. One small change was made in the construction of the tail. I added a strip of 1/16-inch-thick balsa to the trailing edge of the rudder and elevator. This strip is sanded to match the airfoil, which improves the looks of the finished parts when they are covered.

I replaced the rear former and tail-wheel assembly supplied with the kit with a Robart, scale, tail-wheel assembly. In order to install this unit, it was necessary to cut a new rear former and move it forward to allow the tail wheel to exit the fuselage in the proper location. Du-Bro* 4-40 pull-pull cables were used to control the tail-wheel steering. Remember to install the cables prior to installation of the rudder post.

After the tail-wheel installation has been finished, the completed stab cores and rudder post are installed according to the instructions. Remember to glass the stab spars to the fuselage *prior* to installing the rudder post.

Build the wing's center-section flap, and install it. To complete the fuselage construction, install the ABS plastic trim parts, cockpit and canopy.

COMPLETING THE WINGS

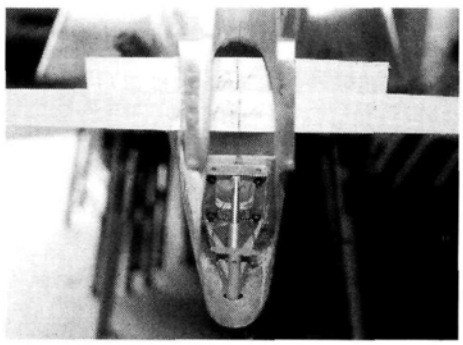
The outer wing panels are now completed by cutting out the ailerons and the outboard split flaps. By using the wing drawing and the manual, you will find this to be an easy job. I extended the wing side of the Robart hinge points used on the ailerons by adding 2-inch lengths of 7/32-inch diameter brass tube. Crimped onto the hinge points, this strengthens their installation into the foam-core. Finally, fill any dings and finish-sand the wing panels.

FINISHING NOTES

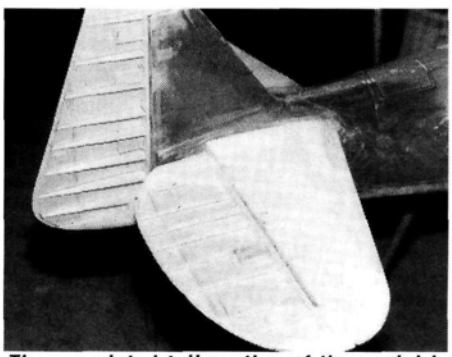
My AT-6 has a painted finish, and the wing panels and stabs were covered with 0.06-ounce fiberglass cloth. The elevators and rudder were covered with Sig Koverall. See my article published in the October '94 issue of *Model Airplane News* for details on how to apply the fiberglass to the wings.

In Part 2, we'll cover the engine installation and muffler options, and the pneumatic air system, and I'll offer some advice on the selection and use of adhesives when building this type of kit. In Part 3, I'll look at radio installation and the flight performance of the finished Byron AT-6 Texan. Until then, remember: big is better!

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

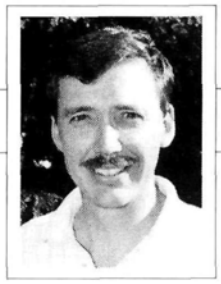


The front and rear stabilizer spars are in place in the tail of the fuselage. Note the Robart tail wheel installed below.



The completed tail section of the model is shown here. The stabs will be blended into the fuselage with filler/putty to form a smooth fillet. The rudder and elevators will be covered with Sig Koverall before the surface is permanently hinged into place.

SIMPLE PROGRAMMING



DAVID C. BARON

HITEC'S NEW FLASH 4- AND 5-CHANNEL PROGRAMMABLES

PROGRAMMABLE R/C flight has taken another giant step into the future. It seems like only yesterday that Futaba* and JR* came out with their first programmable radios. These were 7- to 9-channel systems, but they introduced us to the value and flexibility of having microprocessors in our transmitters. Throughout last year, radios were introduced and aimed specifically at the general and entry-level markets. Hitec's* Prism was the first to break the $300 (discounted) price barrier for programmable radios. Since then, similarly priced radios followed from almost every manufacturer in the same price range.

NEWS FLASH

Hitec is now going further. Their new Flash radio is simple and has a smart selection of features and functions that will make it very appealing. The true magic of this radio, however, is that its price is targeted to be under $200 (discounted)!

SPECIAL FEATURES

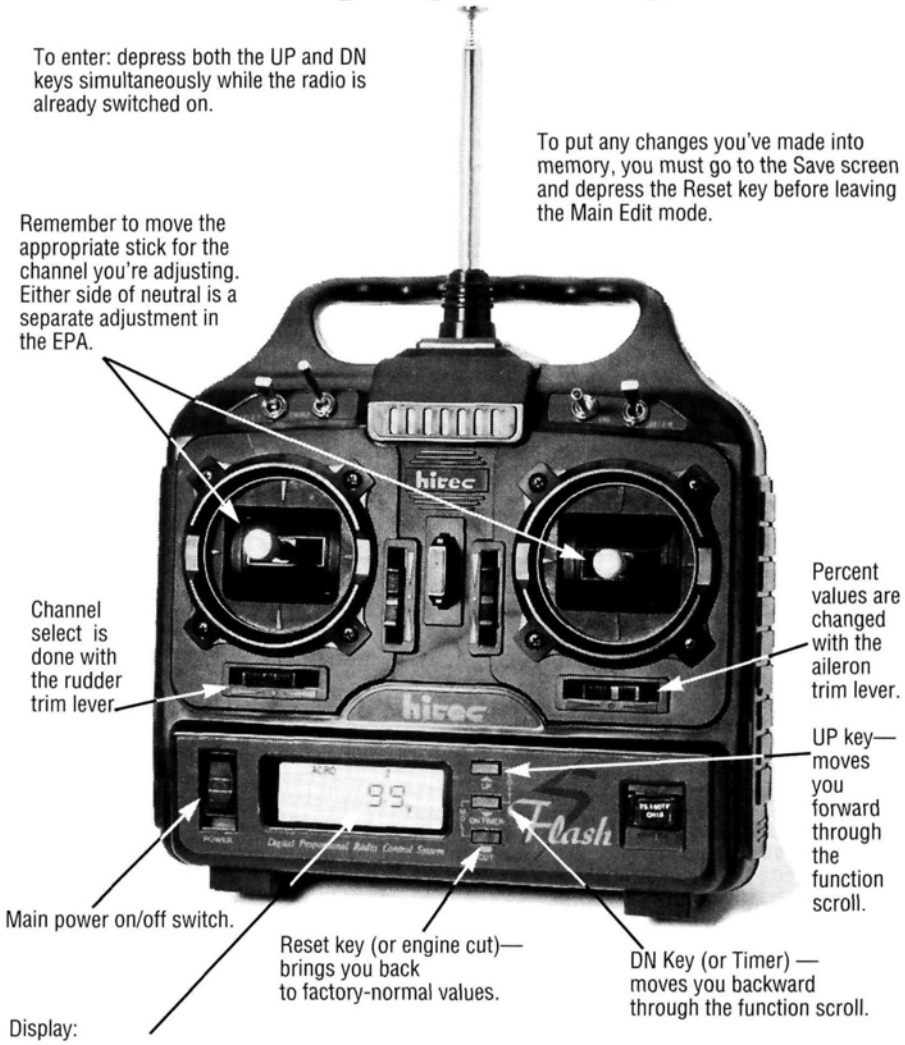
• **Elimination of mechanical trims:** the Flash has electronic trims; this really is an impressive step for this level of radio. The only other radio that has this feature is the top-of-the-line Futaba ZAP! It makes great sense for any multi-memory radio, because it reduces the chance of your plane being out of trim when you switch from one model memory to another. You still must remember to save your settings in the "Save" mode before turning off your radio.

• **Auto-engine kill button:** to some extent, this is an extension of the electronic trims. You obviously can't just swipe at the throttle trim to kill your engine on command, so this feature allows a complete engine kill any time that you are below half throttle. In addition to its obvious use, it is an outstanding safety value.

• **Two-model memory:** given the intended customer group for this radio, I believe that two memories are plenty.

• **A special EPROM chip instead of a back-up battery for storing settings:** this feature is one that I hope we will see much more of. Most programmable radios use a five-year lithium battery to protect the programmed memory, and the manufacturers don't want you to change your own battery either. I sent back a radio last year that was almost five years old, and the technician sent back a note that the battery "tested" fine and did not need to be replaced. This does not give me peace of mind, because now I have no benchmark other than "five years" for replacing the battery. Will I go out to fly one day soon and find that my precious memory is

Main edit programming hints



gone? Will I lose it in flight? I don't even want to think about that last one!

FLASH'S FUNCTIONS

• **Model-memory select mode:** this mode is entered by depressing the DN timer key and the Cut key simultaneously while turning on the radio.

In the display, you will see "SL," signifying the select mode. Over the SL, you will see either a small number 1 or 2. This represents which memory (or model) has been selected. To switch from one to another, you depress the Cut key. This is the only function change I found that does not require the use of the Save mode.

• **Initial mode:** this mode is entered by depressing the UP and DN timer keys simultaneously while turning on the main power.

• **Mode configuration:** (a choice between modes one and two). This is choosing between left-stick throttle and right-stick throttle. In the USA, we lean strongly toward throttle on the left or, as I like to think of it, the right stick is identical to a full-size aircraft's control stick.

• **Flight-timer settings:** the flight timer can be set from 1 through 30 minutes. It will beep for the last 10 seconds of the timed period.

• **Aileron/rudder-mixing master switch:** use to mix the aileron and rudder control.

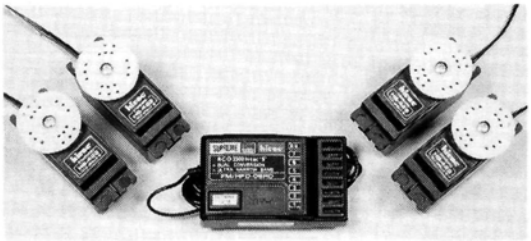
HITEC FLASH

Hits

• Smart programming • Great feel
• Great price

Misses

A tradeoff for the Flash's low price is that the operator must save any trim changes before switching off the transmitter. Otherwise, the settings will return to their previous positions when the transmitter is switched back on. It would be nicer if changes in the software were permanent when the decision is made to change. It may be argued that this type of system allows the user to try a new value before permanently adopting it, but I would think that this is not one of the best ways to use multiple-model memories.



The flight pack that comes with the Flash radio includes the standard HS-422 servos and the Supreme receiver.

• **Elevon-mixing master switch:** use to mix elevator and aileron control.

• **Vee-tail-mixing master switch:** use to mix rudder and elevator control.

• **Data memory save:** return to this function, and save after making any change that you wish to keep.

• **Data memory reset (to factory settings):** this is the best way to start out with a new plane.

THE MAIN EDIT MODE

This mode is entered by depressing the UP and DN timer keys simultaneously when the radio is already on.

• **Endpoint adjustment:** this feature allows the best possible throw to be established for a given maneuver or for an installation to have the best mechanical advantage. What is often overlooked and is cause for confusion is that there are separate endpoint adjustments for left aileron versus right and up-elevator versus down. Many modelers only adjust one side and think they are done. You need to move the control stick in order to adjust the other half of motion. Be sure to remember to move the appropriate stick.

• **Exponential adjustment:** the aileron, elevator and rudder can all have the ratio of stick motion versus servo motion changed around neutral stick position. A negative value desensitizes the motion around center stick. This could be used to make a plane feel less jumpy without giving up total control throw at the extremes. A positive value will sensitize the control motion around the center-stick position. This is commonly used for rudder control, where we are not as comfortable using large amounts of stick throw. Conversely, the throttle is very well set up to accentuate either extreme. A high positive value gives you a very soft high-throttle servo throw in proportion to stick movement, and a large negative value gives you a very soft low-throttle servo throw in proportion to stick movement.

A nice touch included in all Hitec packages is this flight preserver foam cushion. Wrapped around the receiver, it protects it from vibration and takes up less room than a standard foam sheet.

• **Dual-rate adjustment (Flash 5 only):** my favorite use for this function is in training environments. You can have a sensitive set of values for yourself and calmer settings for your students.

• **Servo-reversing:** hopefully, you should all know this one by now.

• **Trim memory:** after you make a change with a digital trim next to the control stick, you still need to go to this function at the end of your flight to save the new value.

• **Trim memory reset:** if you get too many trim adjustments all in the same direction, you may reach the end of the authority of the trim. In this case, you would need to re-center the trim using this function and make the appropriate mechanical adjustment on the aircraft.

• **Aileron/rudder mixing settings:** for those who like coordinated turns without having to use your left stick.

• **Data save to memory:** return to this function, and save after making any change that you wish to keep.

CONCLUSION

By breaking through another price barrier, this radio is in a class by itself. All of the other manufacturers will be back at the drawing board to think up a way to top this radio. Congratulations to Hitec.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

EXHILARATING

WARNING: Before flying Wayne Handley's Raven you must be ready for an exhilarating, accelerating, adrenaline pumping flight! The full-scale Raven is a high horsepower, lightweight aircraft that accelerates from zero to 100 mph in 8 seconds, and has a roll rate of 270 degrees per second! Like the full-size Raven, Global's exclusive scale model performs Handley's signature *wratchet rolls, whoo-wee tumbles, double hammerheads, double bug flickers,* and *the chiropractor* with perfection. The Raven is capable of unbelievable aerobatic performance on a .60 2-stroke or a .90 4-stroke engine. The kit features high quality, die and machine cut balsa, hardwood, and balsa plywood parts; a crystal clear molded canopy; custom spinner; custom Raven decals; molded wheel pants; wire main gear; detailed plans; and step-by-step instructions. Hurry to your local Global Quality Kits dealer because... you've never left the ground until you've flown the Raven!

LENGTH, F/LOA: 40.5/50.5 in.
WINGSPAN: 62 in.
WING AREA: 638 sq. in.
ENGINE: .60 -.65 2-stroke
RADIO: 4-ch. req'd. (R/E/A/T)

Global Quality Kits is manufacturing the Raven under exclusive license from Wayne Handley.

GLOBAL QUALITY KITS

WAYNE HANDLEY'S

RAVEN

Global Hobby Distributors 10725 Ellis Avenue Fountain Valley CA 92728-8610

Airplane Kits Bonus Buyers' Guide

WHAT'S THE MOST important decision a modeler must make? Is it which landing gear to use? Which servo arm? No, it's "What's my next project going to be?" To most, an empty building table simply won't do, so, in this spirit, we proudly present the 1995 *Model Airplane News* Airplane Kit Buyers' Guide—the ideal source to help you pick your next R/C aircraft.

The guide includes 12 categories of popular airplane kits from leading manufacturers. From trainers through pattern planes, all the way to ducted-fan jets and giant-scale planes, you're sure to find the right kit for your tastes. And we haven't forgotten rotary-wing fliers; there's a special section dedicated to helis. If scratch-building is your interest, we have information on sources of construction plans.

Additionally, we've added a separate category just for all those "must-have' building supplies and bits: necessities that make construction more enjoyable. If you're in the market for a new kit, or you're thinking about buying your first airplane, look no further than this guide!

AIRPLANE KITS

TRAINERS

BRIDI AIRCRAFT DESIGNS

Bizzee Bee

This large, ¼-scale-size trainer is for flying and ground handling, and it's capable of all AMA and FAI maneuvers. It can be used with engines from 1.6 to 3.7 (twin cylinders or gas engines). Constructed of balsa and lite-ply, this low-wing sport flier features a tapered symmetrical airfoil, wheel pants, windshield, cowl, pre-sanded parts, full-size plans and easy-to-use instructions. Specifications: wingspan—96 inches; weight—13 pounds (without engine); engine—1.6 to 3.7.
Part No. QTR 1250
Price: $334.95

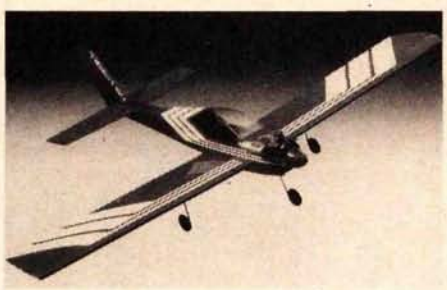
CARL GOLDBERG MODELS

Freedom 20

This aircraft has clean lines and flight characteristics suited to novices. The kit includes: precision-cut balsa/plywood; all the necessary fittings/hardware; illustrated plans and instructions; light wheels; and a formed cowl and wheel pants. Specifications: wingspan—55.5 inches; length—43 inches; engine—.20 to .30 2- or 4-stroke; wing area—440 square inches; weight—52 to 60 ounces; radio—4-channel.
Part No. 57
Price: $74.99

The Eagle II

This easy-to-fly kit comes with prepared balsa/plywood parts and a manual to facilitate building for modelers of all skill levels. Instructions on how to use 4-stroke or electric power and on how to install floats are included. Specifications: wingspan—63 inches; engine—.40 to .60; wing area—715 square inches; radio—4 channel.
Part No. 56
Price: $89.99



The Tiger 60

Here's the only plane that tops the popular Tiger 2 when it comes to confidence-building stability, silky-smooth control response and ultra-precise aerobatic performance. Simply stated, the Tiger 60 is the ultimate all-round sport model and low-wing trainer.
Part No. 68

COX PRODUCTS INC.

Katydid—1/2A ARF

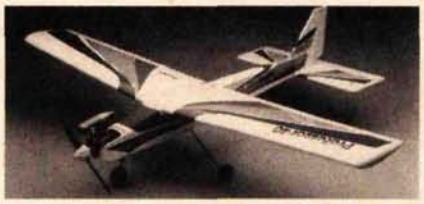
Here's the least expensive way to get into R/C aeromodeling, and it's one of the easiest ways, too. On three channels, you can master the basics and then move on to basic turns, spirals, loops, axials and snap rolls. Katydid is covered with top-quality film and supplied with hardware and decorative stickers. Specifications: wingspan—41 inches; length—28 inches; wing area— 265 square inches; recommended engine—Cox Dragonfly (not included).

DIRECT CONNECTION R/C

The Eclipse Trainer

The Eclipse Trainer will outshine all the other 40-size trainers on the market. The kit features a fully illustrated instruction manual, computer-drawn full-size plans, precision-sanded parts, all-wood construction and a generous hardware package. After you've mastered the basic flying techniques, push up the throttle and enjoy a highly responsive, fun, sport plane. Specifications: wingspan—65 inches; length—52 inches; area—755 square inches; weight—5 to 5.5 pounds; engine—.40 to .46; radio—4-channel.
Part No. DC-10
Price: $79.99

FUTABA



Professor 40 ARF

Here's a perfect trainer. Quickly constructed using a combination of advanced ARF techniques and the finest hardwoods, balsa and light foam, this 90-percent-built plane will suit beginners and experienced modelers. Elevator, aileron and rudder are pre-hinged. You supply glue, a radio, an engine and engine accessories. Specifications: wingspan—59 inches; length—41 inches; wing area—540 square inches; weight—5.25 pounds; power req'd—.40 to .45 2-stroke or .60 4-stroke. This is no ordinary ARF kit!
Part No. P1040
Price: $189.95

HOBBICO

SuperStar 60

The popular SuperStar 40 is now available in a large .60 size. The 90-percent-built construction of the SuperStar 60 AWARF means it can be ready for flight in as little as 15-20 hours, and the better visibility, added stability and smooth flying performance of this majestic model make it an excellent choice for beginners. This 69-inch-span model requires a .46 to .61 2-stroke or .48 to .80 4-stroke, and a 4-channel radio with four servos.
Part No. HCAA2058
Price: $199.99

HORIZON HOBBY DISTRIBUTORS INC.

Easy Fly 40 ARF Trainer

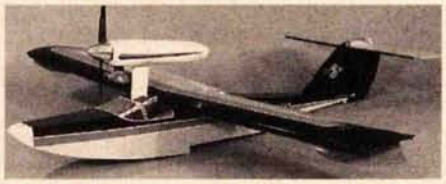
The Easy Fly 40 is a 90-percent-built, almost-ready-to-fly (ARF) trainer designed from the ground up to bring together the highest quality materials and the best features of today's trainer aircraft at a reasonable price. The Easy Fly combines high-grade balsa and ply-

SPORT

ACE R/C

Clipped Wing Taylorcraft

construction. Kit includes detailed rolled plan sheets, a step-by-step assembly manual, glass cowl and formed landing gear. Specifications: wingspan—90 inches; wing area—1,300 square inches; weight—12 pounds; engine—.90 to 1.5 2-stroke or 1.2 to 1.6 4-stroke.
Part No. 50G5040
Price: $239.95



Seamaster 40

The Seamaster 40's high-lift wing provides slow, predictable flight, and a quick "up-on-the-step" to break water. Also, while on water, the pylon-mounted engine and T-tail stabilizer stay out of the spray while accelerating. A retractable water rudder stops "weathervaning" and makes water handling a snap. A steerable nose gear (furnished) handles those chores when it's in the ground mode. Specifications: wingspan—59.5 inches; wing area—725 square inches; weight—7 pounds; engine—.40 to .45 2-stroke or .60 4-stroke.
Part No. 50K229
Price: $114.99

AMERICAN AERO

RC 120

New for 1995 and added to American Aero's already established line of kits is the new RC 120. Designed by R.C. Speerly, a veteran RC'er who loves sport aerobatics, it features all-balsa construction, a built-up wing, full-size blueprints and instructions. Specifications: wingspan—68 inches; length—53½ inches; wing area—952 square inches; weight—7 to 7½ pounds; engine—.60 to 1.08 2-stroke or .90 to 1.20 4-stroke.
Part No. RC 120
Price: $119.99

BOB DIVELY MODELS

Nuthin Honey

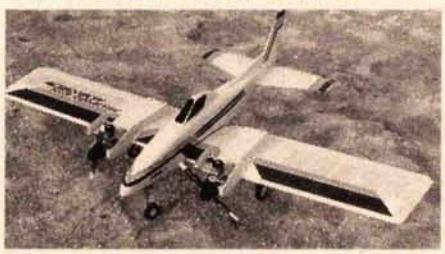
Bob Dively Models announces the release of a new sport biplane called the "Nuthin Honey." This highly aerobatic sport bipe is small enough to transport without disassembling, yet large enough to be fun to fly. Specifications: wingspan—top wing 40½ inches, bottom wing 38½ inches; wing area—593 square inches; weight—4 to 5½ pounds; engine—.40 to .45.
Part No. SBNH-1
Price: $99.95 (list price);
$69.95 (introductory price).

BOB PARKINSON MODELS USA

Quick-Build Jets™

We bet you can! That's right; our Quick-Build Jets™ include a two-hour instructional video to show you how it's done. Call for more information.
Price: $189 (Cheetah™); $229 (Jaguar™-not shown); $20 (video only).

BRADFORD KITS



Bobcat Twins

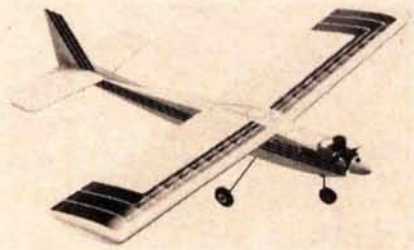
These twin-engine models are easy to fly, so they're excellent for average fliers. Available in several sizes, as kits and as pre-builts, they come with hardware and a complete instruction book. Power them with two .15 to .60 engines, or try the electric version. They all need a 4-channel radio.
Price: starting at $105.

BYRON ORIGINALS

.60-Size Sukhoi

This down-size version of the 27-percent-scale Byron Sukhoi contains many standard components, including: hand-laid fiberglass fuselage and cowl; wire-cut plug-in wings; landing gear; tires; decals; die-cut wood; a clear molded canopy; a molded cockpit; a fuel system; and every nut and bolt required to finish the model.
Part No. 6130200
Price: $295.55

CARL GOLDBERG MODELS



The Falcon III

This aircraft's light wing loading and smooth aerodynamic shape make it easy for beginners to handle. Its clean, semisymmetrical airfoil provides graceful aerobatics, and the interlocking balsa/plywood construction guarantees performance.
Part No. 50
Price: $99.99

The Tiger 2

Its symmetrical airfoil and long tail moment will deliver precise aerobatic performance at the command of experienced pilots, yet the Tiger 2's superb stability and ultralight wing loading make it an ideal first low-wing model.
Part No. 66
Price: $109.99

wood for a durable but light frame and wings. It has natural self-righting characteristics to return to straight-and-level flight from any position. Top it off with genuine Goldberg Ultracote covering. It's simply the best trainer out there.
Part No. HAN1400
Price: $149.95

MAJOR HOBBY

ET-40

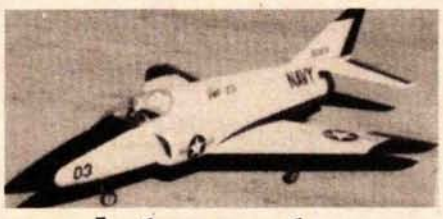
Engineered for easy assembly and superb flight characteristics, the ET-40 is one of the best trainers around. It's capable of moderate aerobatics, including inverted flight, axial rolls and loops, and it offers a wide range of speeds and slow-landing capability. The 32-page, photo-illustrated instruction book and full-size plans add to the ease of construction. Specifications: wingspan—62 inches; wing loading—17 ounces/square foot; wing area—682 square inches; engine—.28 to .50 2-stroke; controls—ailerons, elevator, rudder and throttle; options—trike, tail-dragger, or floats.
Part No. 01MJH1003
Price: $79.95

THUNDER TIGER USA INC.

Tiger Trainer 40 ARF

The Tiger Trainer 40 sets new standards in the looks and performance of ARF trainers. The attractive, molded-ABS cowl and scale-like upper fuselage are topped off with a colorful trim scheme. Assembly is easy, with all difficult building and covering tasks completed by skilled, factory craftsmen. An extensive hardware package is also included. Smooth, forgiving flight characteristics and "self-recovering" stability combine to make flying safe and enjoyable. Specifications: wingspan—61 inches; wing area—675 square inches; wing loading—15.8 ounces/square foot; length—51 inches; weight—5½ pounds; engine—.35 to .46; radio—4-channel.
Part No. 4504
Price: $149.99

TOP GUN AIRCRAFT



Interceptor

Top Gun's Interceptor is fast becoming a fun-fly favorite. The kit features an epoxy/glass carbon-fiber composite fuselage, internal ducting, inlet lips, foam-core wings and tail surfaces, a clear canopy and a set of 100-percent-scale roll-out plans. Using a 5-inch tractor fan unit, such as the Dynamax system, the plane is very fast, but its advanced design ensures that it's also rock-solid and stable at all speeds. The Interceptor will fly off grass; landings are slow and controllable. Specifications: wingspan—45 inches; length—67 inches; weight—10.5 pounds (with Dynamax, Ramtec), 9.5 pounds (with Turbax 1).
Part No. 0102
Price: $359

WINDWARD R/C

1/5-Semi-Scale Ultralight

Innovative construction techniques and materials combine to form this great-looking, stable aircraft that's light and easy to fly. Available in three exciting color combinations, it can be built quickly and easily without special tools, and it comes with all the necessary hardware. It requires a .25 engine and a 3-channel radio, and it's highly crash-resistant.
Part No. TUF-1
Price: $159.95

SPORT

MAJOR HOBBY

Fantasy

The easy-to-assemble Fantasy has great handling and is totally predictable on the ground and in the air. Its new design is so forgiving that it can be an aileron trainer and perform like an aerobatic ship at the same time. It has incredible low-speed handling for slow, soft landings, and it's fully aerobatic, with a thick, stall-resistant, symmetrical wing section. Specifications: wingspan—60 inches; wing area—693 square inches; weight—5 to 5.25 pounds; engine—.40 to .61; options—trike, tail-dragger, or floats.
Part No. OIMJH 1004
Price: $94.95

ACE R/C

Bingo

Believe it or not, the Bingo will take a .40 2-stroke to a .90 4-stroke engine! Most kits list a range like this, but Ace R/C means it! The secret is that the wing is built in two versions to accommodate the engine being used. Construction is conventional lite-ply fuse sides with "tab lock" alignment and a balsa/hardwood wing. The top front of the fuse, hatch and cowl are pre-formed ABS plastic. Specifications: wingspan—70 inches (optional wing is 62 inches); wing area—840 square inches; weight—8 pounds; engine—.40 to .60 2-stroke or .48 to .90 4-stroke.
Part No. 50K232
Price: $114.95

Clipped Wing Taylorcraft

Thrilling aerobatics can be accomplished by Ace's sport-scale Taylorcraft, owing to its semisymmetrical airfoil and light but strong

CLANCY AVIATION

Lazy Bee Kit

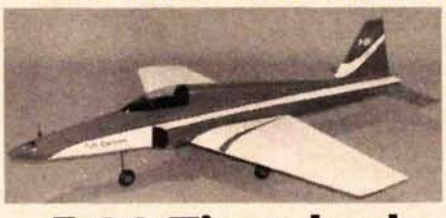
This little gas airplane flies in very small places. It can take off from rough terrain, and it can fly very slowly. The Lazy Bee loops and rolls with ease and has an extremely low stall speed. It's also available as an electric with 20 percent more wing area. Buy the Lazy Bee videotape for an additional $15. Specifications: wingspan—40 inches; wing loading—8 ounces/square foot; radio—3-channel; engine—.049 to .15 or .26 4-stroke. (The model can be converted to an electric using a .035 to .05 motor with or without a reduction drive.)
Part No. LB-1
Price: $54 (includes shipping); $60 (electric version, includes shipping).

COGSWELL ENGINEERING

Ellipse

This 65-percent-complete kit comes with fiberglass wing skins, wheel pants, fuselage and spars, a balsa tail and aluminum landing gear. (Construction and flight videos are also available.) The Ellipse has excellent low-speed directional stability with flaps or without (landings are very slow with flaps). This sport/pattern plane's sleek looks really match its speed! Specifications: wingspan—71 inches; area—729 square inches; wing loading—0.241 ounce/square inch; weight—11 pounds; engine—.60 to .90 2-stroke; radio—5-channel.
Price: $349

DIRECT CONNECTION R/C



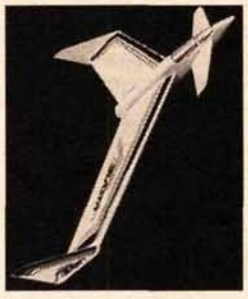
F-20 Tigershark

The fully contoured fuselage, simulated air intakes and tail cone, and optional retractable landing gear are all part of the F-20 Tigershark's sleek, aerodynamic design. Internal linkages, pushrods and control horns add to its realistic looks and speed. Its special airfoil allows the model to slow down for realistic nose-high landings. Specifications: wingspan—47 inches; length—54 inches; wing area—535 square inches; weight—5 to 6 pounds; radio—4- to 5-channel; engine—.40 to .46.
Part No. DC-5
Price: $84.99

F/A-18 Hornet

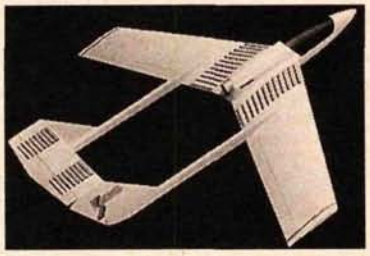
Get realistic jet-like looks with this propeller-driven sport plane; basic balsa and wood construction with built-up wings. Simulated air intakes and exhaust cones, optional retractable landing gear, internal linkages, pushrods and control horns all add to its realistic, jet-like appearance. Specifications: wingspan—53 inches; length: 59 inches; wing area—642 square inches; weight—7.5 to 8.5 pounds; engine—.60 to .91; radio—4- to 6-channel with five servos minimum.
Part No. DC-9
Price: $129.99

ESTES INDUSTRIES



Astro Blaster

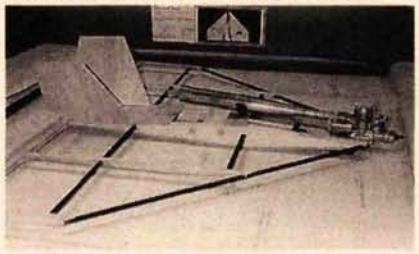
This aircraft is designed for rocket enthusiasts and R/C modelers. It's an R/C rocket glider and a slope soarer, and it's convertible to .049 glow-engine power. The Astro Blaster requires 2-channel radio equipment with a mini or micro flight pack (not included).
Part No. EST 2073
Price: $74.99



Strato Blaster EST 2090

This rocket-powered R/C glider features a blow-molded fuselage, foam-covered wings and die-cut balsa parts. It's configured to fly on Estes E15-P engines, but it can also fly on D11-Ps. The Strato Blaster can be field converted with the included kit to fly on a .049 engine. This aileron/elevator controlled aircraft requires a 2-channel mini or micro gear.
Part No. 2090
Price: $69.99

GILBERT AIRCRAFT PERFORMANCE PRODUCTS



Diamond Dust

Laser-cut plywood, balsa and carbon fiber epoxy/glass spars help you build this kit in three to four hours. The Diamond Dust has one of the widest flight envelopes of any R/C kit. Specifications: wingspan—345 inches; area—570 inches; weight—2.25 to 2.50 pounds; engine—.25 to .40.
Part No. 175
Price: $69.95

GREAT PLANES MFG.

Easy Sport 40

Take a step beyond trainers without leaving behind safe, forgiving flight characteristics with the Easy Sport 40. This maneuverable, 59-inch-span kit is easy to assemble, owing to the interlocking, self-aligning, die-cut wood parts. Even the trim scheme shown on the box can be reproduced quickly and easily with the Easy Sport Trim Package (available separately—GPMQ0405). Requires .35 to .46 2-stroke or .48-.80 4-stroke engine and a 4-channel radio.
Part No. GPMA0150
Price: $109.99

F-14 Tomcat

Without the cost or complexity, the .60-size F-14 looks and performs much like a ducted-fan jet. The front-mounted engine gives sport fliers a familiar design to build and fly, but the

SPORT

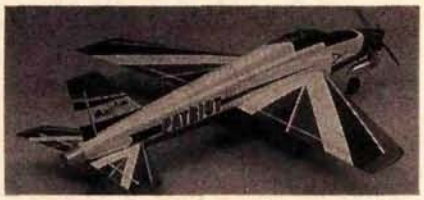
GREAT PLANES MFG.

F-14 Tomcat

kit's jet-like aerodynamics contribute to its fast aerobatic action. It requires a 2-stroke .60 to .75 engine and a 4- to 5-channel radio.
Specifications: wingspan—58.25 inches.
Part No. GPMA0435
Price: $179.99

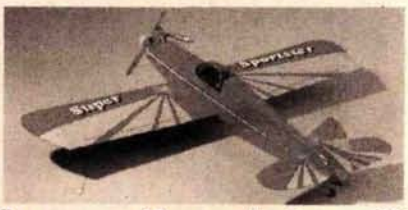
F-15 Eagle

Any pilot who has mastered a trainer can build and fly this jet-like sport model. The 47-inch-span F-15 Eagle features Great Planes' auto-lock construction with interlocking parts. Decals to duplicate the Desert Storm fighter are included. It requires a 2-stroke .40 to .50 engine and a 4-channel radio with four servos.
Part No. GPMA0438
Price: $149.99



Patriot Kit and Patriot ARF

The Patriot combines jet-like looks and speed in its affordable design with a front-mounted engine and prop. Aileron rolls, high-speed passes, knife-edge flight and more are well within its range. The 90-percent prebuilt Patriot ARF features an interlocking wooden structure finished with red, white and blue covering. A comprehensive hardware package is included. Both the kit and ARF version require a 2-stroke .40 to .46 engine and a 4- or 5-channel radio.
Part No. GPMA0430 (kit); GPMA1020 (ARF)
Price: $149.99; $329.99



Super Sportster 40 Mk II Kit & ARF

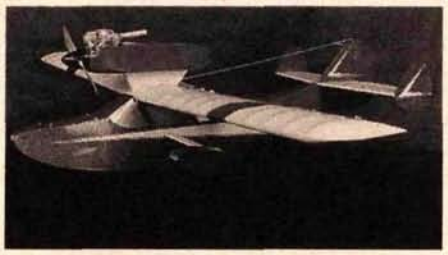
One of Great Planes' most popular aircraft, the Super Sportster is now available in two new versions that "reinvent" this classic. The Super Sportster 40 Prebuilt Kit offers exciting styling, smooth flight habits, and versatile aerobatic capability in a 90-percent-assembled model. An excellent example of absolute cutting-edge technology, the Super Sportster 40 Mk II Kit is easier to build, more aerodynamic and more forgiving in flight than the original version. Both versions require a .40 to 46 2-stroke or.40 to .70 4-stroke and a 4-channel radio.
Wingspan: 55 inches.
Part No. GPMA0205 (kit); GPMA1040 (ARF)
Price: $129.99; 199.99

HANGAR 1 AVIATION

F-4 Phantom

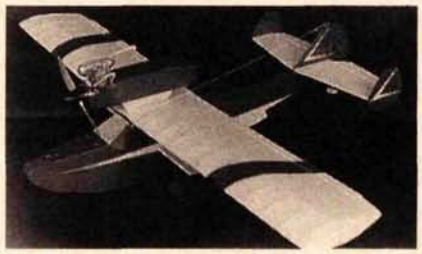
This plane has the looks of a ducted-fan aircraft without its complexity. The F-4 Phantom kit includes a vacuum-formed canopy, formed landing gear and all the wood necessary for construction. Plans, a canopy and a wing are also available for $24.95.
Specifications: wingspan—42 inches; area—272 inches; weight—3 to 4 pounds; engine—.25 to .40.
Price: $99.95

HANGAR DESIGNS



Sea Cruiser

This is a great flying seaplane with scale appearance—smooth easy flying or as hot as you can stand it, all in a smaller size. Easy to build all-wood construction, light wing loading and good aerodynamic design give it superior handling on the water (or snow) and in the air. Hardware included.
Specifications: wingspan—49 inches; area—384 square inches; weight—52 to 60 ounces; engine—.20 to .28; radio—4-channel (required).
Part No. HD-01
Price: $69.95



Sea Cruiser II

Don't miss another season of seaplane flying fun. The Sea Cruiser II features superior handling on the water (or snow); in the air, it's smooth-flying and acrobatic; flies great with any recommended engine; easy-to-build all-wood construction with a semisymmetrical airfoil wing design; hardware included.
Specifications: wingspan—60 inches; area—600 square inches; weight—6½ pounds; engines—2-stroke .40 to .51; 4-stroke up to .65; radio—4-channel (required).
Part No. HD-02
Price: $98.95

HIGH T.E.K. MODELS

Big Eliminator

The Big Eliminator was developed at the request of many .40-size Eliminator owners. This IMAA-legal, 84-inch, 13-pound sport plane is a very smooth, predictable aircraft. The Big Eliminator is capable of knife-edge loops and much more. Like the .40-size Eliminator, it can take off and land in a very small field, thanks to the leading-edge slot and self-stabilizing airfoil. It makes a great trainer.
Part No. EL005
Price: $175

NFS ENTERPRISES

NOTFORSALE II

This improved version of Blaine Stetler's unique design was originally published in *Model Airplane News*. This sport design is capable of gentle flight for the novice, yet allows astounding unlimited maneuvering for the advanced flier. It's a ground-handling and slow-flight specialist. Full-size rolled plans, full instruction booklet and pre-bent

landing gear are included. Kit satisfaction is guaranteed by designer. Available in .40 and .20 sizes, in both basic and deluxe kits.
Part No. NF40; NF20
Price: $89.98; $99.95

NORTHERN WINGS

Kestrel

This flap-equipped, twin-engine trainer has exceptional short takoff and landing characteristics; with its wide speed envelope, it can perform aerobatic maneuvers that will challenge even seasoned sport fliers. Conventional balsa-and-ply construction; complete hardware package; high-quality vacuum-formed parts. Specifications: wingspan—72 inches; engine req'd—.25 to .28.
Part No. NW93002
Price: $129.95

RA CORES

The Gremlin

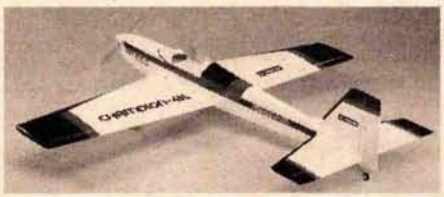
The Gremlin was developed by Eric Henderson as a fun, durable, low-cost, quick-building .25- to .40-size airplane. The Gremlin has spawned single-design R/C combat contests around the country and has become a standard "hot-dogging" plane at many flying fields. If you can handle an aileron trainer, you can fly the Gremlin. Fun, low cost, durability, and short building time (about 6 to 10 hours) make this plane a favorite.
Price: $35

READY-TO-FLY

THUNDER TIGER USA INC.

Champion 45L ARF

The Champion 45L is the perfect choice for sport fliers who want to explore precision aerobatics, or for seasoned pilots who want a sharp-looking aircraft that "goes where you point it." Factory-built and covered, including all necessary hardware and accessories, the Champion 45L is a perfect match for the Pro .46 engine. Specifications: wingspan—55.6 inches; length—51.25 inches; wing area—622 square inches; weight—5½ pounds; radio—4-channel; engine—.40 to.46.
Part No. 4456
Price: $205.99



Super Decathlon 40 ARF

The Thunder Tiger Super Decathlon 40 ARF re-creates the classic lines and aerobatic potential of its full-size namesake. Each model is factory-built from select balsa, ply and spruce, and each is covered in a heat-shrink film with the pictured "Pete Myers" trim scheme. For a scale-like, aerobatic aircraft that your flying buddies won't believe is an ARF, try the Super Decathlon 40. Specifications: wingspan—64 inches; length—45 inches; wing area—694 square inches; weight—6 pounds; engine—.40 to .46; radio—4-channel.
Part No. 4455
Price: $249.99

ALMOST-READY-TO-FLY

DIRECT CONNECTION R/C

Ultimate 10-300S ARC

The Ultimate 10-300S ARC (almost ready to cover) features handcrafted, pre-sanded, all-balsa construction with composite landing gear. The kit includes a fiberglass cowl and wheel pants. The fully illustrated instructions guide you from the workshop to the flying field in no time. An optional 60-inch-wingspan conversion for IMAA is shown in the instructions. Specifications: wingspan—56 inches; length—60 inches; wing area—1065 square inches; weight—8 to 9½ pounds; engine—.60 to .90 2-stroke or .90 to 1.5 4-stroke.
Part No. DC-8
Price: $349.99

FUTABA

Acrostar 120

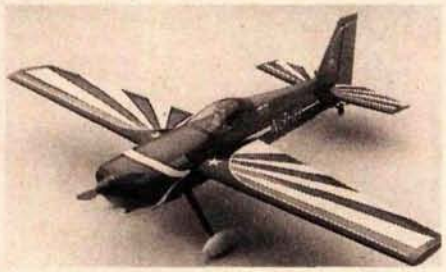
A pre-constructed replica of the European Aerobatic Champion, the Acrostar 120 uses the most advanced ARF design, is 90-percent factory finished and requires no painting or covering. Only the glue, radio, engine and engine accessories are not included. The Acrostar 120 is designed for YS 120 and 120AC engines. Specifications: wingspan—6.75 inches; length—56.6 inches; wing area—806 square inches; weight—9.5 to 9.75 pounds.
Part No. P1120
Price: $549.95

ALMOST-READY-TO-FLY

FUTABA

Acrostar 60 ARF

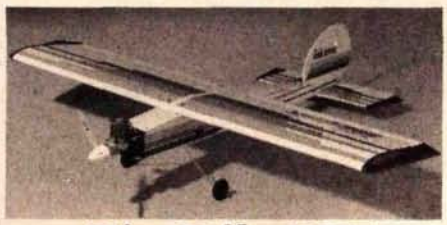
The Acrostar 60 is a semi-scale replica of the European aerobatic champion. All markings are already applied and fuelproofed; no painting or covering is necessary. With its built-up wing, the Acrostar is an exciting performer. Specifications: length—52.75 inches; wingspan—57.09 inches; wing area—600 square inches; weight—6 to 6.5 pounds; engine—.60 2-stroke or .90 4-stroke; radio—4-channel.
Part No. P1060
Price: $359.95



Super Star 90

This is a semi-scale re-creation of Henry Haigh's famous plane. Stunningly skinned in the brilliant red, white and blue markings of the original, it will perform demanding aerobatics, but it's docile enough for sport fliers. All the necessary hardware is included. Specifications: wingspan—63 inches; length—48.7 inches; wing area—665 square inches; weight—7.75 to 8.75 pounds; engine req'd—.60 2-stroke or .91 4-stroke.
Part No. P1061
Price: $399.95

GREAT PLANES MFG.

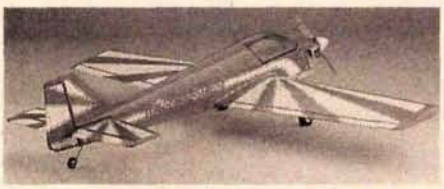


Big Stik ARF

The popular, easy-flying Great Planes Big Stik 40 can now be ready for flight almost out of the box with the Big Stik "Prebuilt Kit" ARF, which reduces building time by 90 percent and offers a choice of exciting trim schemes. Choose from the traditional red with Maltese Cross scheme, or, for a contemporary look, the dazzling blue, yellow, silver and white trim option. An easy step up from trainers, the Big Stik's semisymmetrical airfoil supplies plenty of aerobatic potential. A generous package of high-quality hardware is included. Wingspan: 57.7 inches. Requires: .40 to .50 2-stroke or .60 to .80 4-stroke engine and a 4-channel radio.
Part No. GPMA1030 (modern); GPMA1031 (traditional)
Price: $169.99

P-51D Mustang ARF

Acclaimed as America's most beloved and successful WW II fighter, the Mustang flies again in Great Planes' semi-scale .40 size version. The computer-designed ARF construction includes top quality Great Planes hardware, hand-painted plastic parts and realistic markings for exciting WW II looks. A versatile aerobatic performer, the 56-inch wingspan P-51D ARF features the proven Ultra-Sport airfoil and executes loops, rolls and many other maneuvers with ease. Requires a .40 to .50 2-stroke or .48 to .70 4-stroke engine and 4 or 5 channel radio with four or five servos.
Part No. GPMA1510
Price: $299.99



Ultra-Sport 40 Custom ARF

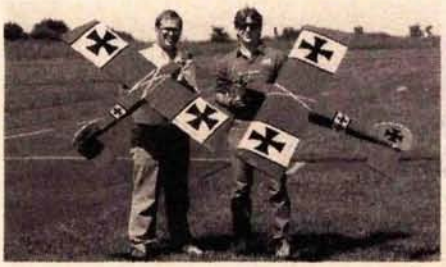
Now the Ultra-Sport's unlimited aerobatic performance is available in an easy ARF design, featuring a high-quality, balsa/ply structure wrapped in a durable, colorful, light composite covering. This model requires a 2-stroke .40 to .46 or a 4-stroke .60 to .70 engine, a 4- or 5-channel radio and a prop. Specifications: wingspan—55 inches.
Part No. GPMA1010
Price: $299.99

HOBBICO

Viper RTC

With a .19 to .25 2-stroke engine, the Viper RTC (ready to cover) is a great first aerobatic model. With a .40, it has won several Quickie 500 contests. All-wood and 70-percent complete, it comes ready to cover, and it requires only an engine and a 4-channel radio with four servos. Wingspan—52 inches.
Part No. HCAA5000
Price: $134.99

HORIZON HOBBY DISTRIBUTORS INC.



Das Ugly Stik

Sport aircraft perfection! This is the phrase that best describes the original Phil Kraft-designed Ugly Stiks. Both the .40-size and .60-size planes are great-looking, easy-to-build, fun-to-fly airplanes for the novice and experienced pilot. These superb-quality kits include high-grade wood components, complete hardware, and a pre-covered wing, fuselage and tail. Photo-aided instructions make assembly a breeze. Whichever version you choose, you're sure to enjoy Das Ugly Stik!
Part No. LTS40; LTS60
Price: $149.95; $189.95

ELECTRICS

CARL GOLDBERG MODELS

Electra

This kit has flight qualities suited to both beginners and experts. The Electra offers die-cut balsa/ply parts and hardware. The deluxe version comes with a complete power unit. Specifications: wingspan—78.25

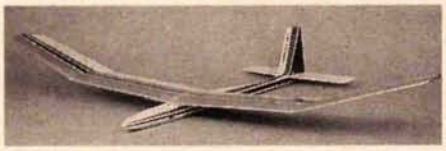
inches; length—41 inches; motor—.05, with 6- to 7-cell; radio—2- to 3-channel.
Part No. 40
Price: $54.99 (basic); $84.99 (deluxe).

Mirage 550

Deluxe features, hands-off stability and long glide make the easy-to-build Mirage a good choice for beginners. Nevertheless, its advanced aerodynamics deliver performance that even an expert will appreciate.
Part No. 42
Price: $89.99

ELECTRICS & GLIDERS

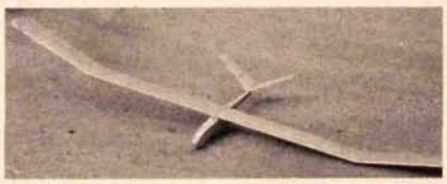
CARL GOLDBERG MODELS



Gentle Lady

This aircraft is suitable for beginners. It's suitable for winch or high-start launches and can be adapted to electric or glow power with a power pod. The kit has shaped leading and trailing edges, cut parts, hardware, instructions and plans. Specifications: wingspan—78 inches; area—663 square inches; radio—2- or 3-channel.
Part No. 60
Price: $39.99

CHARLIE'S



Classic II Glider Kit

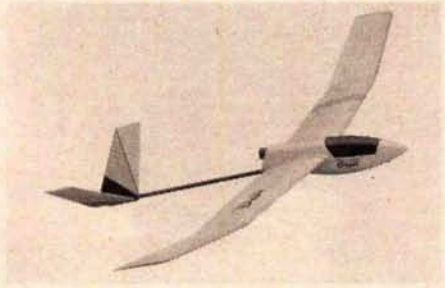
The Micro Series Classic II Glider Kit is finally available again, and it's a new, more versatile kit. Two wings are included: one 37-inch and one 60-inch. A vee-tail option is also included. All parts are machine-cut. Weight (without radio)—3.5 ounces.
Part No. 11002
Price: $29.95

DODGSON DESIGNS

V-Gilante

So you've built—and become proficient at flying—inexpensive "starter gliders." You're looking for a "high-tech" performing glider that's a quality builder's kit and doesn't cost a month's mortgage. What if this glider could accept two interchangeable sets of wings: 2-meter and 100 inches? Check out the 100-inch V-gilante! Specifications: wingspan—100 inches; wing area—750 inches; flying weight—42 ounces; wing loading—8 ounces/square foot; fuselage—MonoSeam fiberglass; wings—foam and obechi; airfoil—SD7037.
Price: $175

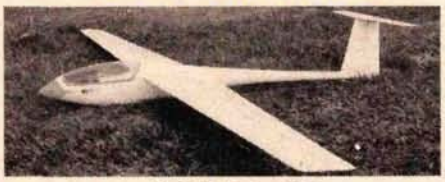
ESTES INDUSTRIES



Sweet Vee™

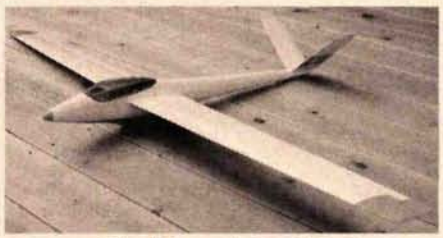
The third addition to the new tradition of Estes R/C Rocket Gliders is the Sweet Vee™. Named for its vee-shaped tail, this airplane has registered flights of approximately an hour long at the Estes plant! This kit comes with a special molded-plastic mechanical mixer, alleviating the need for elaborate R/C equipment. Other features include a fiberglass boom, blow-molded fuselage and obechi-covered foam wings. R/C equipment, including two mini- or microservos, is needed to fly this plane. Specifications: wingspan—55 inches; length—34 inches; wing area—340 square inches; weight—16 to 20 ounces; engines—D11-P, E15-P.
Price: $99.99

ICARE SAILPLANES



ASW-19

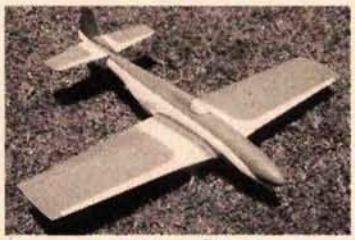
This little scale sailplane is a nice low-budget project. This model is very versatile, but more suited to slope flying. The kit comes with a white epoxy/fiberglass fuselage. The wings are obechi-sheeted foam with routed ailerons and installed push-cable tubes. The kit comes with all hardware, a building plan, instructions and a parts list. Specifications: wingspan—82 inches; wing area—480 square inches; weight—42 ounces; airfoil—HQ.
Price: $145



Salto H 101

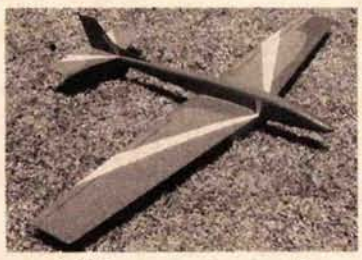
This little scale sailplane was specifically designed for the slope. It's very handy and fully aerobatic. The kit comes with a white, fiberglass-reinforced, epoxy fuselage. The wings are obechi-sheeted foam. The wing joiner and aileron cable are installed, and the aileron has been routed. The kit comes with all hardware, a building plan, instructions and a parts list. (A built-up wing kit is available for $95.) Specifications: wingspan—53 inches; wing area—210 square inches; weight—16 ounces; airfoil—GOE 795.
Price: $145

K&A MODELS



Dago-Red Racer

The Dago-Red Racer is a very high-performance slope glider in a very small package. It can be converted to ½A gas or electric with ease, and it's also available with a fiberglass fuselage. Specifications: wingspan—30.5 inches; wing area—188 square inches; weight—12 to 13 ounces.
Price: 39.95 to $79.95



Silverstreak

The Silverstreak is new from K&A Models. This 50-inch slope glider is one of the best in its class. It's very fast and is

ELECTRICS & GLIDERS

K&A MODELS

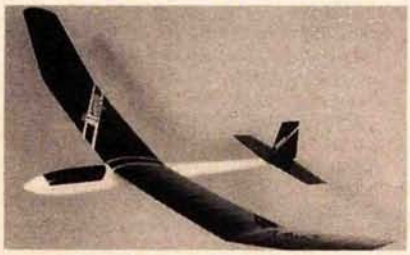
Silverstreak

capable of performing full aerobatic maneuvers. The Silverstreak is also available with a fiberglass fuselage. Specifications: wingspan—50 inches; wing area—287 square inches; weight—19 to 20 ounces.
Part No. 104-103
Price: $59.95 to $98.95

Thermal-Buster

The Thermal-Buster is designed for the hand-launch enthusiast. Its construction makes it a light but very strong glider.It's also available with a fiberglass fuselage. Specifications: wingspan—59 inches; wing area—354 square inches; weight—13 to 14 ounces.
Part No. 108-109
Price: $42.95 to $82.95

MAJOR HOBBY



Tempo

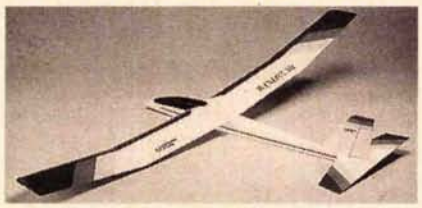
A one-piece, molded, unbreakable fuselage and simple, built-up wing make the Tempo an excellent kit for beginners and for fliers who have rough landing areas. The Tempo has a molded-in servo tray and tow-hook recess; and the fuselage comes with a 1-year warranty against breakage. A clear canopy, a balsa tail, main hardware, a rudder and an elevator control are included. The 76-inch-span Tempo requires medium to small servos, a receiver and a battery pack.
Part No. 05MJH1001
Price: $54.95

NSG HOBBIES

Aerotech A-10 Warthog

This A-10 Warthog is a 48-inch R/C slope-soaring glider that's capable of taking punishment! A 2- to 3-channel radio can be used, and all hardware and covering are included. This kit is fast and easy to build (6 to 8 hours). The Warthog is computer-designed for precision aerobatic performance. It has a symmetrical airfoil for high-performance inverted flight. It was designed with a triple leading edge for durability.
Price: $47.94

THUNDER TIGER USA INC.



Windstar ARF Sailplane

This 2-meter sailplane takes only four hours to assemble from box to launch! Expertly handcrafted of select woods and covered in lightweight film, the Windstar requires only final assembly and radio installation before enjoying the challenges of silent flight. An advanced polyhedral wing design and a light wing loading give the Windstar a responsiveness never seen before in an ARF design. Specifications: wingspan—77.3 inches; length—44.5 inches; wing area—574 square inches; weight—40 ounces; wing loading—10 ounces/square foot; radio—2-channel; standard servos.
Part No. 4102
Price: $114.99

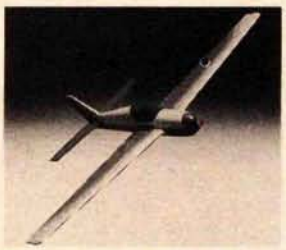
PATTERN

AEROPLAN, INC.

Hurricane

Designed and flown in FAI-F3A competition by Oscar Cespedes, the Hurricane is the first pattern airplane manufactured from honeycomb composite material. Kit includes: honeycomb composite fuselage; foam wings, stab and rudder; honeycomb composite firewall; and wing tube. Specifications: wingspan—75 inches; length—78 inches; wing area—1,000 square inches; weight—9 to 10 pounds; engine—120 FS.
Price: call for pricing.

CARL GOLDBERG MODELS



Dave Patrick's Finesse

This specialized pattern aircraft is available in three sizes, in the forms of prefabrication and finish desired.
Part No. 45; 46; 47; 48.

RACING

DIRECT CONNECTION R/C

Doddger

The Doddger is a proven Quickie 500 racer with all the tricks included. The kit includes the parts and instructions for the modifications needed to create a vee-tail or mid-tail version, if you prefer those to the standard version. The kit includes all machine-cut, hand-selected balsa. Specifications: wingspan—50 inches; wing area—500 square inches; engine—.25 to .45.
Part No. S-3
Price: $54.99

SCALE

AMERICAN MODEL MANUFACTURING

Super Decathalon

Builds into a great looking and flying scale model. Eighty-inch wing for .60 to .90 2-

stroke or equivalent 4-stroke engines; smooth flying and very aerobatic. Features: epoxy/glass fuselage, cowl and wingtips; formed windshield and wheel pants; foam-core plug-in wings; fast, easy building.
Price: $169 (plus $15 shipping)

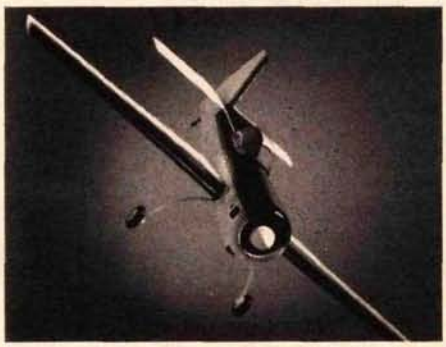
CARL GOLDBERG MODELS

The Cub

This kit includes balsa/ply materials, hardware, a formed cowl, windows, a dummy engine, snap-in struts and decals. An instruction book and plans facilitate building. Specifications: wingspan—76.5 inches; engine—.40 to .60; area—744 square inches; radio—4-channel.
Part No. 63
Price: $109.99

The Extra 300

Among sport-scale aerobatic models, nothing can top the Extra 300 for silky-smooth tracking and control response. When slowed to a walk, the Extra's superb glide and easy-as-you-please landings make it feel like a trainer. Specifications: wingspan—68 inches; area—850 square inches; weight—7.5 to 8.5 pounds; length—61 inches; engine—.60 2-stroke; .90 to 1.20 4-stroke.
Price: $209.99



The Sukhoi SU 26MX

The Sukhoi has all the features that have helped make CGM kits all-time favorites. Its low parts count means you spend less time building and more time flying, and its clearly illustrated, step-by-step instructions and plans leave nothing to the imagination. Specifications: wingspan—72.5 inches; wing area—949 square inches; weight—8.75 to 9.5 pounds; engine—.90 2-stroke, 1.20 4-stroke. Kits includes formed cowl (with louver detail), canopy and belly pan, tempered-alloy landing gear and glass-filled nylon engine mounts.
Part No. SU26MX

Super Chipmunk

This replica comes with formed-plastic parts; decals; hardware; precision-cut wooden parts; plans; and an instruction book. Specifications: wingspan—64 inches; length—53 inches; engine—.45 to .60 2-stroke, .60 to .90 4-stroke; radio—4- to 6-channel.
Part No. 52
Price: $149.99

Ultimate Thriller

A big, beautiful version of Gordon Price's original 10-300, the Ultimate Thriller features pre-formed cowl, canopy, wheel fairings, cabanes and glass-filled mount. Specifications: wingspan—54 inches; area—980 square inches; weight—7.5 to 8.5 pounds; power—.60 2-stroke; .90 to 1.20 4-stroke.
Price: $199.99

CROWN MODELS

F-5 Tiger

Crown's new F-5 Tiger was designed for pilots looking for an advanced jet without the expense and complications of ducted fans. The kit includes an impressive epoxy fuse, pre-sheeted wings, full flying stab and hardware. It builds and flies fast with .40 to .60 high-performance engines. Large sealed flaps allow safe landing speeds. It's a no-compromise kit! Specifications: wingspan—49.5 inches; length—56 inches.
Price: $289.95

GREAT PLANES MFG.

Piper J-3 Cub

Great Planes has recreated the Piper Cub and its barn-door ailerons to scale. This flier features nearly all-balsa wooden parts and interlocking construction. The kit can be built with a 76.5-inch wing or a 61.5-inch clipped wing. It requires a 2-stroke .40 to .60 or a 4-stroke .48 to .80 engine and a 4-channel radio.
Part No. GPMA0160
Price: $149.99

HANGAR 1 AVIATION

F-105 Thunderchief

This semi-scale jet features a foam wing and typical box-and-former fuselage construction, and it includes a hardware package. The engine is mounted in the nose. Specifications: wingspan—33 inches; weight—3.5 to 4 pounds; engine—.35 to .46 2-stroke; radio—4-channel.
Price: $109.95

PACIFIC AEROMODEL MFG., INC.

Sukhoi Su-26

Here's a perfect scale model that's made in the USA and can be assembled in only a few hours. This .40-size aircraft does complicated aerobatics as well as the full-scale prototype does. Kit includes: cowl, canopy, fuel tank, wheels, aluminum landing gear, spinner and all the necessary hardware. Specifications: wingspan—54 inches; area—520 square inches; length—42 inches; weight—5.2 pounds; engine req'd—.40 to .46 2-stroke or .48 to .60 4-stroke; needs a 4-channel radio.
Part No. JL-409
Price: $199.99

SCALE

ROYAL PRODUCTS CORP.

B-17 Flying Fortress

The Royal B-17 is a scale project that's exciting to build and fly and a sure attention-getter. (Cockpit is included.) Specifications: wingspan—77.75 inches; engine—.20 4-stroke; area—806 square inches; radio—4-channel.
Part No. 79-289
Price: $294.95

Royal B-25

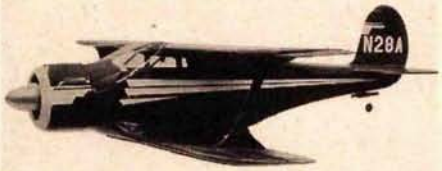
This truly scale project combines performance and scale beauty. The kit includes spun-aluminum cowls and a cockpit. Specifications: wingspan—70.9 inches; engine—.40 to .61; area—750 square inches.
Part No. 79-290
Price: $234.95

Royal Douglas C-47

This is an excellent scale project for twin-engine enthusiasts. Select materials and handcrafted prefabrication make this twin-engine plane a pleasure to build and fly. Specifications: wingspan—83.16 inches; engine—.40 to .60; area—767 square inches.
Part No. 79-299
Price: $274.95

Royal P-38 Lightning

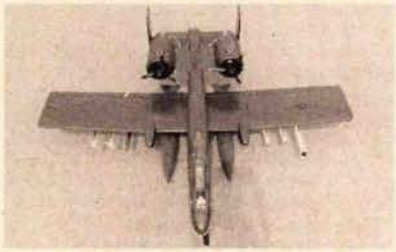
The Royal P-38 Lightning has pre-cut balsa and is built-up to capture, in true scale, one of the all-time WW II favorites. (Cockpit is included.) Specifications: wingspan—74.25 inches; engine—.35 to .60; area—695 square inches.
Part No. 79-291
Price: $314.95



Staggerwing Beech

Here's an excellent scale project for biplane enthusiasts, scale builders and sport modelers. Specifications: wingspan—56 inches; engine—.60 to .80; area—907 square inches.
Part No. 79-298
Price: $204.95

TA-KING OFF HOBBIES



A-10 Warthog

This A-10 Warthog by John Georgeoff is not too big and not too small, and, when powered by two prop-driven .21-size fan motors and tuned pipes, it's the best-sounding, most powerful hog on the market! It will fly easily with .25-size standard engines, too. Wing and fuselage construction is of balsa, foam and ply. Specifications: wingspan—48 inches; length—44 inches; weight—5½ pounds; radio—4-channel. Full-size plans and an instruction booklet are included.
Part No. A-10 48-inch
Price: $159.95

TOP FLITE

Cessna 182 Skylane

Top Flite's newest "Gold Edition" scale project, the 1/5-scale Cessna 182 Skylane, is engineered so that modelers with average building skills can successfully achieve detailed scale accuracy. This 81-inch wingspan, IAA-legal kit provides precisely interlocking, CAD-engineered wood parts and numerous precision-formed ABS parts for fine scale detail with minimal effort. A .61 to .90 2-stroke or .91 to 1.20 4-stroke engine and a 4 to 5 channel radio with five to seven servos are required.
Part No. TOPA0300
Price: $299.99

Gold Edition AT-6 Texan

This authentic-looking .60 to 1.20, 69-inch-span AT-6 is relatively easy to assemble and offers gentle flight characteristics. The kit's computer-designed interlocking parts fit perfectly, and the instruction manual explains how to add optional retracts. The special scale touches include a detailed, vacuum-formed "greenhouse" canopy. An engine and a 4- to 7-channel radio are required.
Part No. TOPA0130
Price: $249.99

Gold Edition F4U Corsair

This 62-inch-span, sport-scale model enables modelers who have average assembly skills to create the famous gull-wing warrior. The computer-engineered kit features interlocking parts and many vacuum-formed details. It requires a 2-stroke .60 to .80 or 4-stroke .91 to 1.20 engine, and a 4- to 7-channel radio.
Part No. TOPA0100
Price: $249.99

Gold Edition P-40E Warhawk

With its computer-designed, interlocking wooden parts, this 64-inch-span scale model is easy to assemble. It comes with more than a dozen vacuum-formed scale details and three huge sheets of authentic decals. Operational split flaps increase its scale realism, and the fuselage is roomy enough for retracts. Optional retracts, a fuel-drop tank, spinner and in-cowl muffler are also available. The Warhawk requires a .61 to .91 2-stroke or a .90 to 1.20 4-stroke engine and a 4- to 7-channel radio.
Part No. TOPA0120
Price: $249.99

Gold Edition P-51D Mustang

An excellent first scale kit, this Mustang has interlocking parts that fit perfectly. Many vacuum-formed and injection-molded details supply authenticity. A fully sheeted wing adds to the kit's scale realism. Included are a photo-illustrated manual and two huge decal sheets. Specifications: wingspan—65 inches; wing area—734 square inches; weight—8 to 10 pounds; length—56.5 inches; engine—.60 to .91 2-stroke or .90 to 1.20 4-stroke; radio—4- to 6-channel.
Part No. TOPA0110
Price: $249.99

GIANT SCALE

BYRON ORIGINALS

27-Percent-Scale Sukhoi SU-26M

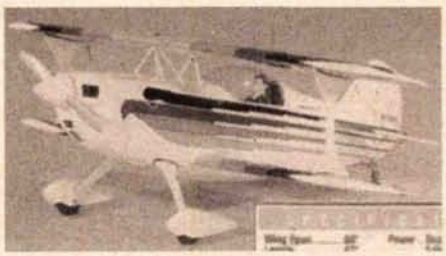
This 27-percent-scale Sukhoi has full aerobatic capabilities and is not difficult to assemble. The complete kit includes: a hand-laid fiberglass fuselage and cowl; wire-cut plug-in wings; die-cut formers; a vacuum-formed canopy; cockpit and air intakes; heavy-duty, bent, aluminum, landing-gear struts; tailwheel and main-gear tires.
Part No. 6130214
Price: $519.95

AT-6 Texan

This award-winning model features a fiberglass cowl and fuselage and wire-cut wings and stabs. The retracts are mounted in the one-piece inboard wing/fuselage section for stable, reliable performance. Byron also offers mounting systems for a variety of 2-stroke gas and glow engines.
Part No. 6130255
Price: $524.95

Cap 231

A wing-root leading edge allows this ¼-scale model to maneuver at low speeds, survive high-G pull-ups and produce clean snap rolls. The Cap 231's "Complete Kit" includes a fiberglass fuse, a cowl and wheel pants, wire-cut wings and stabs, die-cut wood, landing gear, tires, a tail wheel, a fuel tank, a canopy, a cockpit, wing sheeting material and the remaining pieces required for building the basic airframe. Glue, paint, an engine and a radio are not included.
Part No. 6130231
Price: $489.95

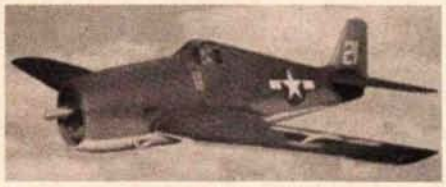


Christen Eagle

This "Rolls Royce of aerobatic planes" features all-foam injection-molded airframe, wings and stabs. The easy-to-remove wings facilitate transportation. Final finishes include glass cloth/resin or Econokote, depending on the desired flying weight. The kit also includes: fiberglass wheel pants and cowl; a fuel system; tires; landing gear; and the nuts and bolts required to complete the model.
Part No. 6130088
Price: $366.25

F4U-1 Corsair

Owing to its one-piece fiberglass fuselage/bent-wing assembly, Byron Originals' 1/6-scale Corsair can be built quickly and accurately. It features a fiberglass cowl and ready-to-sheet wire-cut wing panels.
Part No. 6130140
Price: $520.65



F6F-3 Hellcat

A one-piece front fuselage/inboard wing section serves as a secure mounting platform for retracts. The fuselage, cowl and empennage sections are made of hand-laid fiberglass and feature the scale panel lines of the full-size model. The wire-cut plug-in wings facilitate transportation and storage. All materials, including the balsa wing sheeting, are part of the standard kit.
Part No. 6130201
Price: $545.75

P-51 Mustang

This 1/5-scale P-51 offers several scale features not seen on a giant-scale warbird—a 24-inch 4-blade propeller and sequential landing-gear doors. Its plug-in wings make transportation and storage efficient. The kit includes: a fiberglass fuselage and cowl; injection-molded wings and tail; a complete decal set; and all the basic materials needed to finish the airplane minus an engine, a radio, retracts and final finish.
Part No. 6130051
Price: $524.75

Iron-on-Covering Tools

Using the proper tools can make the difference between making something that looks like your first attempt or doing a professional-looking job. Many gadgets are nice additions to the arsenal, but some, such as the following, are absolute must-haves.

• **Heat irons.** You'll need at least two: one of standard size and one that's smaller for trim. If your budget allows, use two of each size. Set one of each on a high temperature and the others on a low temperature. This will prevent you from being tempted to use the wrong level of heat for speed's sake.

• **Heat-iron covers.** Soft cotton covers protect the covering film from being scratched. They're worth the investment, because most scratches can't be removed. The standard-size covers are readily available, but you'll have to make a cover for the small trim iron. Cut a finger off a soft cotton glove, and tie it over the shoe of the small iron.

• **Tack cloth.** Necessary for final cleaning of the airframe, tack cloth also works well for cleaning the adhesive side of covering material. If there's a piece of dust within 50 yards, it will somehow get between the covering material and the wood.

• **Thermometer.** A thermometer is necessary because most heat irons don't have temperature dials. The numbers on the dials serve only as reference points. Having the correct level of heat is very important when you work with covering. After you've set the iron's temperature (using a thermometer), mark the face of the dial with a permanent marker.

• **Cutting blades.** Iron-on coverings will dull razor blades and hobby knives very quickly, so be prepared to change blades as soon as the old one begins to drag. Save the blade; it will still be sharp enough to cut wood.

• **Straightedge.** At least two straightedges or rulers are necessary: a rigid one for flat surfaces and a flexible one for curved surfaces. A metal tape measure also comes in handy for use on very curved surfaces.

• **Sheet plastic.** A thin piece of acetate or Mylar sheet plastic (approximately 0.005-inch thick) will come in handy when you make a trim cut over a surface that has already been covered. Simply slip the plastic sheet under the piece to be cut. It will protect the underlying covering while the cut is being made.

• **Marking pens.** Fine-point marking pens are needed, because most regular pens won't mark plastic. Permanent ink works best; it doesn't smear, and you can wipe off the marks with alcohol.

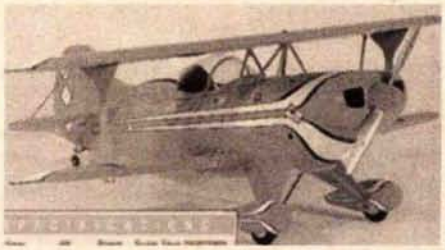
• **Sewing needles.** You'll need sewing needles to puncture any bubbles. Use thin, sharp needles—not pins—to make tiny holes. (Pins are larger in diameter and aren't as sharp.)

• **Ironing board.** An ironing board with a pad and a heat-resistant cover makes an outstanding workbench. You can adjust the board's height, and the pad protects the wood from dings, and the cover protects against iron burns.

—Faye Stilley

GIANT SCALE

BYRON ORIGINALS



Pitts Special

This fully aerobatic ⅓-scale model offers fuselage and wings constructed of injection-molded polystyrene foam.
Part No. 6130001
Price: $379.95

Staggerwing G-17-S

This ⅛-scale aerobatic model is appropriate for sport fliers and serious scale contenders. The kit includes a hand-laid fiberglass fuselage and cowl; injection-molded, polystyrene foam, plug-in wings; and an optional custom-tailored retract system with sequenced doors.
Part No. 6130100
Price: $515

CLARK INDUSTRIES

Supermarine Spitfire MK IXB and MK XII

This ¼-scale kit comes with an engine; retracts; all the necessary hardware; a prop; a spinner; a solid-state ignition; a battery; an ignition wiring harness; a microswitch; full-size rolled plans; an instruction manual; a parts list; and no foam parts. All the wooden parts come cut, and the fiberglass fuselage comes joined. There's absolutely nothing left to buy except paint, glue and a radio. (An info pack and photos are also available for $5.)
Price: $3,250 (Canadian)

Tiger Moth deHavilland DH82c and DH82a

This kit includes: more than 500 precision-cut balsa, hardwood and plywood parts; a hardware package with more than 600 items; a fiberglass cowl; a gas tank; vacuum-formed details; 5-inch-diameter wheels; an assembled tail-wheel strut; a tail wheel; pre-bent landing-gear struts; formed-aluminum cabane struts; plug-in wing panels; a Quadra Q35 engine mount; and a realistic scale center console for servo mounting. The DH82a includes everything you need, except a canopy and some hardware. Both kits come with detailed plans, 24 pages of instructions and a complete parts list. Specifications: wingspan—88 inches; area—2,150 square inches; weight—21 to 22 pounds; engine—Quadra 35 to 42.
Price: $475; shipping $20 (including insurance).

CONCEPT MODELS

1/4-Scale Fleet Model 2

The Concept Fleet is constructed nearly true to scale with most of its structure scaled down from original-size plans. Its modest wing loading and lifting stabilizer enhance its graceful, slow, and fully aerobatic performance. Each kit contains precision-cut balsa, spruce and plywood parts; pre-formed landing gear and cabane struts; complete hardware; rolled plans; and a 16-page instruction booklet including historical data, photos and 3-views of the full-size Fleet Model 2.
Part No. CNCA 1020
Price: $197.95

GILBERT AIRCRAFT PERFORMANCE PRODUCTS

The Giant Unlimited

New from Gilbert Aircraft! Specifications: wingspan—81.5 inches; wing area—1,950 square inches; weight—8.5 to 12 pounds; engine req'd—.90 to 30cc glow.

GTM, INC

Fokker Dri Triplane Kit

This ¼-scale kit was based on historical data and several factory drawings that were coupled and captured in a state-of-the-art CAD system. The kit can be built for fun-flying or for serious competition. It includes two sets of color CAD plans, a 75-page instruction manual, die-cut parts, aluminum struts, brass fittings and all related hardware. Specifications: wingspan—71 inches; weight—15 to 16 pounds; engine—O.S. 160, SuperTigre 2000, or Quadra 35.
Part No. 2001
Price: $482

MEISTER SCALE

BF 109

The ¼-scale BF 109 can be built very easily and quickly; an eight-hour fuselage assembly time is possible for many builders. User-friendly airfoil and light construction allow novice fliers a treat. The kit features five sheets of rolled plans, a two-piece wing, all-wood construction, formed exhaust scoops, gun slots, etc.
Part No. BF109
Price: $135 to $450 (plans only—$45).

NIMBUS AIRCRAFT CO.

DeHavilland Mosquito

This ⅕-scale deHavilland Mosquito kit has a two-piece epoxy/glass fuselage that, combined with a three-piece wing, makes transportation easy. The kit includes a three-piece foam wing and stabs, composite spar, fiberglass cowls and fuselage, and all the basic materials necessary to complete the airplane. Available accessories include custom engines and synchronizer, retracts and wheels, autopilot and cockpit interior kits. Specifications: wingspan—132 inches; power—twin G-62 and up.
Part No. DHM-4
Price: $950

ULTIMATESPORT RC

1/3-Scale Sukhoi SU-29

This ⅓-scale Sukhoi is Ultimatesport RC's latest in their line of high-quality kits. The vacuum-formed fuselage is available in epoxy/glass, or epoxy/Kevlar with a Rohacell core. Features include a clear canopy, aluminum gear and wing tubes, and foam flying surfaces with installed tube sleeves. Available as a builder's kit and as a deluxe sheeted kit. Specifications: wingspan—107.5 inches; length—90 inches; wing area—2,250 square inches. Suggested power: 6ci or larger; 120cc is ideal.
Price: $1295 (builder's glass); $1695 (deluxe glass); $1495 (builder's Kevlar); $1895 (deluxe Kevlar).

GIANT SCALE

ULTIMATESPORT RC

29-Percent-Scale Bucker Jungmann

This 29-percent-scale Bucker Jungmann is Ultimatesport RC's first wood kit. This Dick Hanson TOC design is offered in a component kit only, for the experienced builder and flier. The kit includes plans, a clear canopy, epoxy/glass cowling and wheel pants, foam flying surfaces and turtle decks, and pre-built cabanes and landing gear. It can be built with an 84-inch wing or the 77-inch TOC wing. The fuselage is 78 inches long, and it can be built at 16 to 20 pounds. Power required: 3 to 5hp.
Price: $289 (component kit); $45 (plans).

True Quarter Scale Ultimate 10-300

This high-quality builders' kit consists of an epoxy/glass fuselage, cowling and wheel pants. The cabanes are preformed continuous-filament fiberglass. Also included are pre-bent landing gear, a clear canopy, foam flying surfaces, an instruction book and plans. This kit doesn't include balsa; that's left to the builder's discretion. Specifications: wingspan—62 inches; wing area—1,260 square inches; weight—13 to 15 pounds. Requires a 1.8 to 2.2 gas or glow engine.
Price: $349

DUCTED FAN

AIR FLAIR MFG. CO.

ME 262 A-1a 1/6-Scale WW II Jet Fighter

Designed by Tom Cook, the ME 262 A-1a kit includes: an epoxy/glass fuse, nacelles and a cowl with intakes; full-size plans for building the wing, stab and rudder; and a factory drawing package, with a camouflage and stencil layout. Specifications: wingspan—84 inches; fuselage length—69 inches.
Part No. 1
Price: $330 (includes packing and shipping costs)

BYRON ORIGINALS

F-15 Eagle

This 1/7-scale twin model is powered by a pair of Byron Originals Byro-Jet Performance CAP packages, which use either the Rossi .90 engine or the O.S. .91 engine. Options include a speed brake, landing-gear brakes, retractable main gear and nose gear.
Part No. 6130155
Price: $888.10/kit without options

F-16 Fighting Falcon

Known as "the trainer," the 1/8-scale F-16 exhibits reputable flight characteristics. It has a fiberglass fuselage and injection-molded polystyrene foam wings that can be unplugged for transportation and storage.
Part No. 6130030
Price: $394.25

F-18 Hornet

This 1/8-scale unit features: fiberglass components; injection-molded polystyrene foam wings and tail surfaces; and a single engine. Its bifurcated exhaust system looks like a true twin-engine jet. The F-18 is powered by the Byro-Jet ducted-fan system.
Part No. 6130250
Price: $578.75

TOP GUN AIRCRAFT

F-15 Ultra Eagle II

Top Gun's F-15 Ultra Eagle II has earned the reputation of being the very best entry-level ducted-fan kit available. It's an excellent ducted-fan trainer designed with the grass-field flier in mind. The kit includes a composite epoxy/glass fuselage, pre-molded hatches, clear canopy, foam-core wings, all wood (including pre-stamped plywood formers), all hardware and fuel tanks. The Ultra Eagle's construction is simple, and there's a scale cockpit and a detachable wing option. Specifications: wingspan—51 inches; length—68 inches; weight—10½ pounds; radio—4-channel (5-channel with retracts); engine—.60 to .90 (ducted fan).
Part No. 0100
Price: $339

MiG-29 Fulcrum

Top Gun's MiG-29 Fulcrum is a grass-field, durable, trainer-oriented ducted-fan kit. Its inherent slow-flight characteristics make it a fantastic entry-level kit. It includes a composite epoxy/glass fuselage with pre-molded hatches; a clear canopy; foam-core wings; all wood, including pre-stamped formers; gas tanks; and all hardware. The kit is easy to build, and a scale cockpit and detachable wing option are available. Specifications: wingspan—53 inches; length—76 inches; weight—11½ pounds; radio—4-channel (5-channel with retracts); engine—.80 to .90 (ducted fan).
Part No. 0101
Price: $389

HELICOPTER KITS

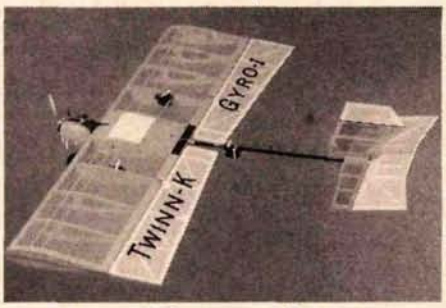
COMPETITION FUN FLY

GILBERT AIRCRAFT PERFORMANCE PRODUCTS

Diamond Unlimited

This aircraft, designed by Jeff Gilbert Sr. and Jr., set national records at two N.C.F.F.A. events in 1993. The kit features laser-cut components and composite construction for easy building. Specifications: wingspan—42 inches; weight—2.25 to 2.5 pounds; engine—.20 to .32.
Part No. 225
Price: $69.95

TWINN-K, INC.



Gyro-1

Twinn-K's Gyro-1 Fun Fly Airplane weighs 2 pounds, 10 ounces fully equipped and is one of the most aerobatic fun-fly airplanes on the market. The kit is complete, the instruction manual is concise and clear, and building time may be less than 10 hours. A plan and jig design are included. Gyro-1 can be flown with a 3- or 4-channel radio, and it comes with a unique, aerodynamic, lightweight landing wheel and strut system.
Price: $89.95

COMPETITION KITS

HORIZON HOBBY DISTRIBUTORS INC.

Enforcer ZR

With innovations aimed at improving aerobatic performance, long-term reliability, and hovering stability, the Kalt Enforcer ZR is designed for novice pilots and hot-dogging experts. It uses premium-quality KSJ main blades, newly-designed flybar paddles, an increased rotor disk and a longer tail boom. For long-term reliability, the ZR rides on 36 ball bearings. Metal balls on all linkage points, a new composite-material main gear, thicker blade grips and a sealed transmission ensure long, trouble-free operation.
Part No. KLT8500
Price: $499.95

KYOSHO

Concept 30 SR-T and SR-X

The best .30-size helicopters have been made even better with the parts-compatible Concept SR-T and SR-X. The entry-level Concept 30 SR-T, available in kit form or pre-assembled with an O.S. .32 SF-H engine included, provides first-time heli modelers with everything needed to succeed: durability, flight stability and an easy-to-understand simplicity of design. The SR-X is Kyosho's most advanced, top-of-the-line .30 helicopter. Available in kit form, it comes with many features and refinements featured on its "big brother," the Concept 60 SR. Required are a .32-.36 heli engine & muffler (included in pre-assembled SR-T version) and a helicopter radio with five servos and gyro.
Part No. KYOE0250 (SR-T assembled); KYOE0260 SR-T kit); KYOE0285 (SR-X).
Price: $529.99; 369.99; 569.99

Concept 60 SR

This new version of the original Concept 60 offers a host of improvements—highlighted by an all-new, flapping-type, rigid, 59.1-inch rotor head—resulting in faster roll rates, increased collective-pitch range, stable fast-forward flight without pitch and powerful, vibration-free tail-rotor response. It requires a .60 side-exhaust engine with a muffler and a heli radio with gyro.
Part No. KYOE0295
Price: $899.99

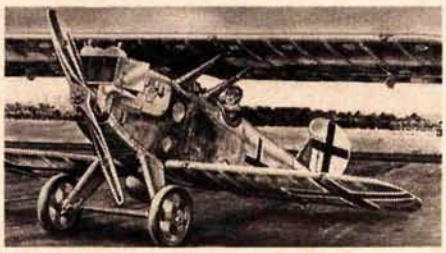
LITE MACHINES CORP.

LMH-100 Helicopter

Radical aerodynamics enable you to fly this durable helicopter with a Cox TD .049/.051! The rugged, injection-molded main rotor has semi-flexible plastic blades that fold upward in a crash. Easy to build, the LMH-100 has far fewer parts than other helicopters. The kit includes a patented Arlton gyro on the tail rotor, a machined clutch and heat sink for the engine, and detailed, step-by-step, illustrated manuals. It requires a 4-channel airplane radio with Deans antenna and microservos, TD .049 or .051 engine and an Ace throttle sleeve.
Price: $199

CONSTRUCTION PLANS

AIRDROME

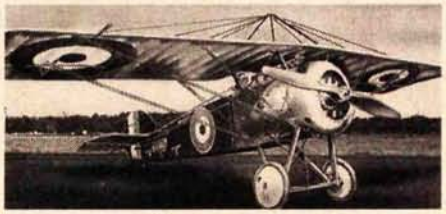


Dornier Zeppelin D.I., 1918

This 2-inch scale aircraft, designed by Steven Stratt, won first place in scale at the '93 KRC. The Dornier is the world's first Duraluminum flighter to use a stressed-skin, torsion-box structure. It is ideally suited to electric scale. Full wings, ribs, formers, cable controls, wiring, full cockpit and many building hints are included. Specifications: wingspan—56 inches; area—935 square inches; motor—Astro Cobalt 40 geared; radio—4-channel radio. Add $4 for rolled plans; $2 for folded plans.
Part No. A-101
Price: $44 (2 sheets)

Focke Wulf Fw56 Stösser

The beautiful Stösser (Hawk) is ideal for electrics! It won 1st in Scale at the '94 KRC, with a 66-inch span and FAI 15 Astro geared motor. In the '30s, it flew aerobatics in U.S. air shows, later serving as a fighter-trainer in WW II. Detailed plans show full wing, ribs, formers, a full cockpit, plug-in L.G. and glow adaptation. New: 2-inch scale, 70-inch span, 602-square-inch area for 40 Astro geared motor, 4-channel.
Part No. A-8
Price: $44 (2 sheets)



Sopwith Swallow, Monoplane No. 2, 1918

Powered by a 25 Astro, Airdrome's model of Tom Sopwith's delightful 1918 parasol won first place in scale at the '92 KRC. Now it's 40-powered. The plans show the full swept wing, ribs, formers, full-scale cable controls, a full cockpit, a scale dummy rotary, split-axle L.G. and cable controls, and they also include many helpful hints for either full AMA or stand-off scale. Specifications: wingspan—60 inches; area—720 square inches; motor—Astro Cobalt 40 geared; radio—4-channel radio. (Add $4 for rolled plans; $2 for folded plans.)
Part No. A-102
Price: $44 (2 sheets)

CHAPIS PLANS

Plans

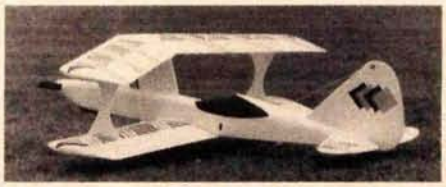
Chapis Plans makes scratch-building fun. Everyone will enjoy the simple, lightweight, low-cost construction techniques. All designs have been extensively tested, and plans are drawn from the templates used to construct the prototypes. To ensure accuracy, the plans are Xerox copies of the original drawings. Trainers, sport and fun-scale designs are available for both electric and glow power.
Price: $1 (illustrated catalogue)

PALMER PLANS

Consolidated B-24D Liberator

These plans include two 36x72-inch and one 36x48-inch rolled sheets, an instruction manual, a fact sheet, model specifications, prototype equipment listings and weight schedules. The outlines are derived from Consolidated Vultee Aircraft Co. drawings. Fiberglass cowls and vacuum-forming are available. Specifications: wingspan—110 inches; wing area—1,192 square inches; weight—13 pounds; radio—6- or 7-channel.
Part No. B-24D
Price: $69

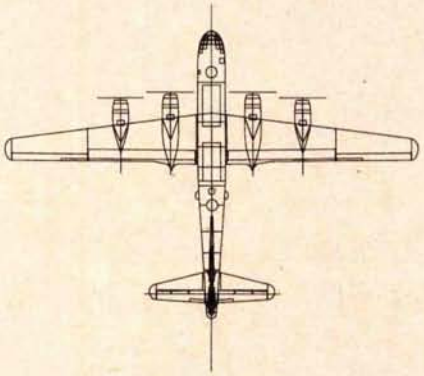
THE CUTTING EDGE



Sport Biplane Plans

Named for its extended knife-edge capabilities, the "Cutting Edge" never fails to get noticed. Torque rolls, tumbling maneuvers and even consecutive knife-edge loops are all within reach with this powerful design! A 64-inch wingspan makes it eligible for IMAA-sanctioned events; and its weight of 12 pounds, coupled with a 19 ounce/sqare foot wing loading, and custom, dual-cambered, semisymmetrical airfoil provides sparkling aerobatics on a 1.08 2-stroke engine. A 3/16-inch aluminum LG unit is available.
Price: $25

MAECO



Vintage Airplane Plans

Vintage airplane plans; R/C or control-line; engineered from government documents for accuracy; materials list and instructions. B-29 Superfortress specifications: wingspan—82¾ inches; length—58 inches; wing area—535 square inches; suggested prop—9.5 inches; engines—CL .19 to .35, RC .29 to .40; plans—3 sheets rolled. Also available: Douglas C124 Globemaster and Curtis C-46 Commando.
Price: $44 (B-29); CA residents add 8¼ percent sales tax.

GENERAL

AIR GROUP 1

Solid Mahogany, Hand-Carved Aerosculptures

These magnificent, hand-painted, museum-quality models are amazingly detailed and a joy to behold; 200 different models from WW I to modern jets; wingspan to 30 inches. Big 16-page full-color catalogue is yours free.
Price: $79 and up

AMERICAN RADIO CONTROL

Portable Canopies

Portable canopies are available from American Radio Control. Many sizes are available.
Price: $229.99 (20 x 20)

The Hobby Connection

ARC Publishing presents "The Hobby Connection"—full-color classified ads. From manufacturer to dealer to end-user; the magazine that brings together buyers and sellers; complete exposure to clubs around the world; any type of hobby item you'd like to advertise.

Preparing to use iron-on covering

TIPS ON USING MONOKOTE

Before starting to cover an aircraft, you must be well-prepared. It's critical to the success of the project. Not being prepared is like taking off alone before you've learned to fly. Iron-on covering materials have wondrous qualities that enable you to cover almost anything of any shape. They're light and strong, they come in many colors, and there's none of the mess associated with painting.

There is, however, a lot to learn, and it's unwise to learn on that newly finished aircraft. Get acquainted with the characteristics of the covering material by experimenting. Build an open structure such as a portion of a wing with a wingtip, and make a stab or fin out of a scrap of sheet balsa that's about ¼ inch thick. By experimenting with these two mock-ups, you'll learn to cover an open structure, a compound curve and a solid wooden surface. Don't rush; the time you spend learning now will later save you hours of grief—and the cost involved if you have to tear the covering off and start again.

The various brands of iron-on covering have different characteristics that are seldom mentioned in their instruction sheets, but the character of each is straightforward and predictable. When you're familiar with the material you've chosen, the covering process will go smoothly (no pun!) and without surprises.

Here are some things I've learned (by trial and error) about MonoKote:

When you apply high temperatures (300 degrees Fahrenheit and above):

- It will shrink rapidly.
- It will stick to wood so tightly that it will take wood with it if you pull it off.
- It can "seal into" the wood, and allow the grain to show through.
- It's strong enough to warp lightweight structures. This can be helpful when you want to correct an existing warp or add washout to a wing.
- It will bond to itself permanently and will be destroyed if you try to pull the pieces apart.
- It will melt if you hold a heat gun too close for too long.
- It will become rubbery and stretch easily.
- At high temperatures, a sealed-down wrinkle is permanent.
- Bubbles will form quickly and unexpectedly when you put film over a film surface.
- Adhesive will be squeezed out from under the top layer along joints.

When you apply low temperatures (200 to 220 degrees Fahrenheit):

- It will begin to shrink slowly.
- It will adhere to itself but will not form a permanent bond.
- It may be smoothed out over solid surfaces without trapping air bubbles.
- It will "tack" to itself, but not well to wood.
- At low temperatures, it's easier to position trim, and it isn't bonded permanently.

Other characteristics:

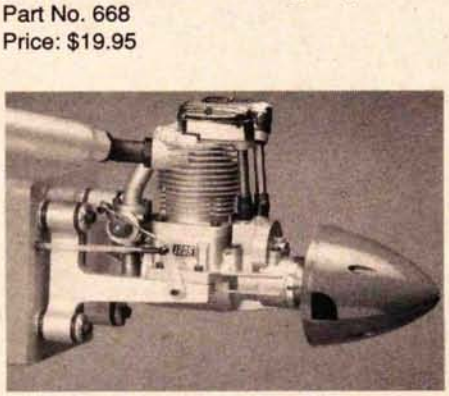
- It will stretch even without being heated, so you can tack it smoothly into place before you shrink or seal it.
- It's easily scratched, because it's plastic. To avoid this, use a soft cotton cover on your iron.
- It's thin, so pressure from your iron can dent the wood beneath it.
- It can be pulled away from the wood when it's being stretched and the adhesive is hot. Hold it in place for a few seconds to allow it to cool down.
- If the backing sheet has been removed and it's left with the adhesive sides touching, it can stick to itself and be damaged.
- It sometimes sticks to the backing sheet firmly, but never permanently.
- It dulls razor blades, modeling knives and scissors very quickly.
- Its color, from roll to roll, is not always consistent. If you need more than one roll, compare them closely, or order a 25-foot roll.

These are not criticisms of the material. These are characteristics which, when known, can be used to advantage to make covering your aircraft easier and much more enjoyable.

When you can make a list like this about the covering you plan to use, you're ready to start covering that beautiful new creation. Remember: when it comes to getting acquainted with your covering material, a minute spent is an hour saved.

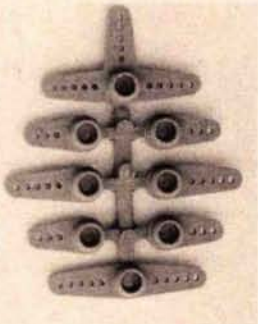
—Faye Stilley

and gas cars, boats and helicopters. Like the Kwik-Start, the Kwik-Start XL comes with a Sanyo sub-C Ni-Cd battery, a charger and a free Kwik-Mount Storage Klip.
Part No. 668
Price: $19.95



Motor Mounts

Du-Bro's patented, revolutionary-design motor mounts are very effective at reducing airframe vibration and fatigue. They're totally captive and cannot debond and break free. The outer rib of the elastomeric absorbs the initial torque loads of the engine, while the inner solid portion leaves plenty of compression to effectively absorb the power impulses that cause most of the vibration in the aircraft.
Part No. 682 (for .45 to .80 4-stroke); 684 (for .75 to 1.08 2-stroke); 686 (for .80 to .91 4-stroke); 688 (for 1.20 to 1.50 4-stroke and 1.20 to 1.80 2-stroke); 689 (replacement elastomeric elements for nos. 684, 686 and 688).
Price: $27.95; $29.95; $31.95; $33.95; $10.95



Super Strength Servo Arms

Du-Bro's Super Strength Servo Arms have impressed modelers with their strength and performance on R/C cars, boats, helicopters and airplanes. These servo arms are molded of long fiber composite material for increased strength. Available in standard and long versions for Futaba, JR, Airtronics, Hitec, Hobbico and Tower Hobbies servos.
Part No. 672 (long—for Hitec, Tower Hobbies and Hobbico); 673 (standard—for Futaba); 674 (standard—for JR and Airtronics); 675 (standard—for Hitec, Tower Hobbies and Hobbico).
Price: $9.95; $7.95; $7.95; $7.95

IRON-ON-FILM MAINTENANCE

One of the nice things about iron-on film is that it requires very little maintenance. It's important, however, to clean fuel off the film regularly—preferably after each flight. Fuel will soften the raw edges along seams. This happens slowly, so if you clean the surface regularly, you shouldn't have any problems.

• **Cleaners.** There are basically two types of cleaners: those with mild grease-cutting capability, such as the typical glass cleaners; and those with heavy grease-cutting capability, such as heavy-duty kitchen cleaners. Glass cleaners are adequate for regular cleaning. If you don't clean often, use a heavy-duty cleaner first, then a glass cleaner. *Never* use a cleaner that contains an abrasive; it will scratch and dull the covering film.

• **Cleaning cloth.** All paper, no matter how soft it feels, is abrasive. Paper towels will eventually dull your aircraft's finish. Use soft cotton cloths. Old, worn, terry-cloth towels are excellent. The more you wash them, the softer they become.

• **Polish.** Use plastic polish to ready your old bird for show and for protection. Check auto-supply stores for polish made for cleaning and polishing plastic windows. Some have a very mild abrasive to help rub out small scratches. Most have wax, which fills minute scratches. A good coat after a thorough cleaning will provide protection and make future cleaning easier.

• **Loose edges.** Occasionally, seam edges become loose. If you've used a plastic cleaner, clean the adhesive side of the loose piece with alcohol to remove any wax before you attempt to reseal it with heat. There might also be fuel residue between the two pieces of film. Clean it off with alcohol instead of glass cleaner, just to be safe. Alcohol won't affect most film coverings. Don't use acetone, lacquer thinner, or any strong solvent.

• **Oil-impregnated wood.** If fuel residue gets under the covering and the oil gets into the wood, you won't be able to reseal the covering. Spray the wood with K2-R—a product made for cleaning clothing, carpets, etc. It absorbs oil and grease, and it dries into a powder. Simply peel back the covering (or cut it away) and spray the wood with K2-R. After it has dried, brush the wood clean and reseal or replace the covering. Heavy oil saturation may take two (or more) treatments.

A clean airplane not only looks good, but it also lasts a long time!

—Faye Stilley

FLIGHT GROUP 1

Pilot Commander Chronograph Watch

Designed for use by Air Force and Navy pilots, this stunning, high-tech watch does it all. It has dozens of functions, with six hands, four dials, twin push-buttons, a recessed face, a rotating bezel and a brushed and polished stainless-steel band. This precision, quartz, water-resistant attention-getter is a solid investment that promises to increase in value. Each watch is a Flight Group 1 exclusive and comes with a money-back guarantee and a lifetime warranty.
Price: $99

HJJ CO., INC.

Non-Magnetic Screw-Holding Screwdriver

Don't drop that screw! Hang on to it with a non-magnetic HJJ screw-holding screw-

BOB SMITH INDUSTRIES

Maxi-Cure

This extra-thick CA bonds most types of plastic (including polycarbonates), hardwood, metal and rubber in 10 to 25 seconds. Complements our Insta-Cure and Super-Gold CAs.
Price: $3.29 to $29.99

NEW Insta-Set and Un-Cure

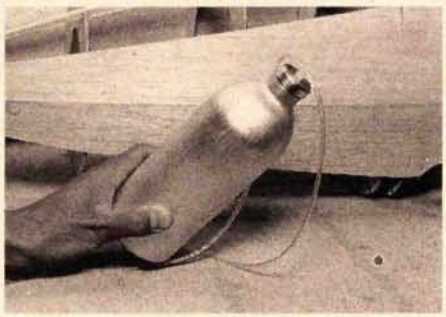
Our new formula for Insta-Set is freon-free and totally compatible with all plastics and white foam. Strawberry scented Insta-Set cures CAs to a clear, non-brittle solid. Also available are Un-Cure, extender tips, applicators and replacement tops.
Price: $4.99/2-ounce Insta-Set; $10.99/8-ounce Insta-Set refill; $2.99/1-ounce Un-Cure.

BOB VIOLETT MODELS

Catalogue

From the Maverick to the F-4 Phantom, and everything in between, the choice is yours. Nine totally complete jet model kits, as well as BVM engines, accessories and landing gear that are top-of-the-line. Each kit is detailed in this 32-page color catalogue that also explains all the options, such as Jet Wheels and "BV" Brakes.
Price: $6

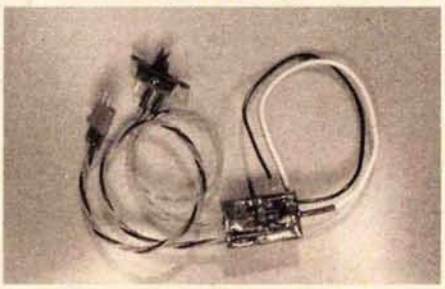
BODDEN MODEL PRODUCTS



Safe-Tank

No more exploding plastic air tanks! Bodden Model Products introduces a new line of airborne air storage tanks. Called the Safe-Tanks, these all-aluminum tanks are tested to 300psi and samples are burst-tested to 600psi for a safe working pressure of 100psi. The Safe-Tanks come in three sizes for use in larger planes to handle the high volume of air required for big retracts. Sizes range from 2.5-inch diameter x 6.5-inch length to 3-inch diameter x 10.5-inch length.
Part No. BP501; BP502; BP503
Price: $32.95; $34.95; $36.95

CHARLIE'S



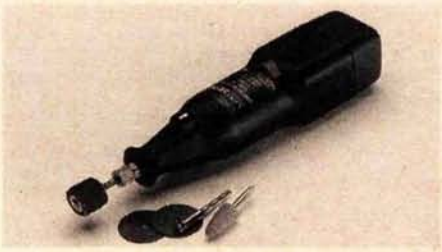
Speed Controls

Model SC-75-S: 9.5 grams; ultra-high frequency; 10,000 IPS-75 watts. Model SC-75-BEAC: 10.5 grams; ultra-high frequency; 10,000 IPS-75 watts.
Part No. SC-75-S; SC-75-BEAC
Price: $61; $94.95

Taylor Power Pacer

The L.R. Taylor Power Pacer is a great airplane saver! It charges and cycles transmitter and receiver batteries, shows battery capacity, and warns of bad cells in pack.
Part No. PP-M-300
Price: $99.95

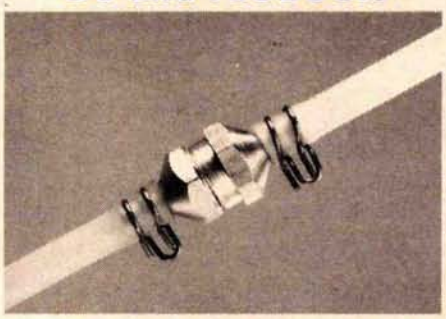
DREMEL



MiniMite

This cordless tool allows accuracy and control. With speeds of 5,000 and 10,000rpm, the MiniMite can be used for precise drilling, sanding, shaping and grinding. It works with all ⅛-inch and smaller shank Dremel-tool bits, and it is equipped with a rechargeable, removable battery pack and a plug-in battery charger.
Part No. 750
Price: $52.50

DU-BRO PRODUCTS



Fuel-Line Clips

Du-Bro's new fuel-line clips help prevent fuel tubing from coming off fuel fittings. Available in two sizes to fit Du-Bro's medium (3/32-inch i.d.) and large (⅛-inch i.d.) fuel tubing. These fuel-line clips are zinc-plated and are packed four to a package.
Part No. 677 (medium); 678 (large).
Price: $1.25

Kwik-Start XL

Du-Bro Products has introduced an XL version of their already popular Kwik-Start Glo-Plug Ignitor. It's designed to reach those hard-to-reach areas such as airplane cowls

HJJ CO., INC.

Non-Magnetic Screw-Holding Screwdriver

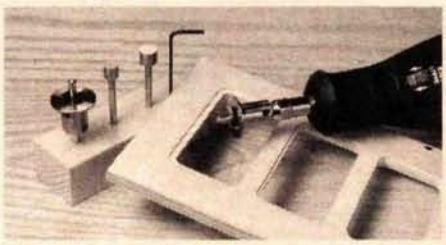
driver. In one easy step, this time-saving tool firmly grips the screw head with expanding twin bits. The tool won't release the screw until the threads take hold and it is pulled free. And, of course, the screwdriver is just as efficient at removing screws from difficult spots. For slotted and cross-shaped recessed screws.
Price: $5.40

JAMES L. WARDROPE ASTRODATA

BATgraph

The original on-board E.S.V. BATgraph is now even better. The new DEbug BATgraph features the same great unbreakable E.S.V. with a glitch recorder that completely checks the transmitter and receiver for problems; checks interference, weak batteries and bad cells, stalled servos and battery charge; 1- to 18-cell packs.
Part No. 4C (airplanes); 4CA (gyros and PCMs).
Price: $28.95 (w/DEbug option $38.95); $33.95 (w/DEbug option $43.95).

JDM PRODUCTS



ROUT-A-BIT

This new freehand routing tool for all rotary hand tools lets you inlay windows, doors and hatches perfectly! Width and depth of cut are adjustable; three rabbet cut widths: ⅛-inch, 1/16-inch and 1/32-inch; routs inside and outside edges; self-cleaning action; cuts balsa, hardwood, plywood and plastic. This tool is a mini-router in itself.
Part No. 34491
Price: $25

GRIDLOCK

INEXPENSIVE R/C TRANSPORTER

I tried all kinds of tricks to prevent things from banging into one another in the bed of my truck. The problem finally came to a head when the fuselage on one of my planes rolled over and the prop stuck through the wing. That wasn't my first transportation problem; once, my toolbox tipped over and wiped out a stab.

My solution came from what traffic police call "gridlock," which means that when an intersection is filled with cars going one way and the light changes, cars headed the other way can't move because they're blocked. The idea of blocking everything in place so that it couldn't move seemed to be exactly what I wanted to do when I transported R/C equipment.

The solution was so simple that I don't know why I didn't think of it before. I cut holes in Styrofoam to create a grid of pockets, which are used in various ways to keep articles such as landing gear in place. The size and shape of the pockets can be changed to accommodate a variety of aircraft and accessories.

By cutting the foam with a saber saw, I was able to keep the walls of the pockets and the sides of the blocks fairly square. This is important, because the blocks must fit back into the pockets after they've been removed. Using a knife blade in the saw made cutting very easy. Knife blades are available for most saber saws.

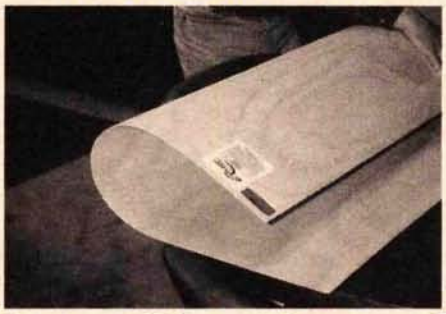
MR. HOUSEFLY

R/C Field Fly Box

Plans and specifications are now available for the R/C Field Fly Box from Mr. Housefly. With the Fly Box, you can carry everything you need, and you can stand up to start your engine.

Price: $21.95 ($2 added to credit-card purchases; Iowa residents add $1 sales tax.)

RITECO SUPPLY INC.



Hoop Pine Plywood

Produced in Australia since 1917 from plantation-grown trees, this premium-grade plywood is free of open-hole knots and compressed areas. Uniquely flexible, its grain is tight and its color is uniform (much whiter than parana pine), so it's great for hobby work. Never before marketed in the USA, rigorous tests have proved that this hoop pine plywood's laminations will never separate.

Part No. Widths of 1.5mm, 3mm, 6mm, 12mm (interior and exterior).

Price: Depends on width.

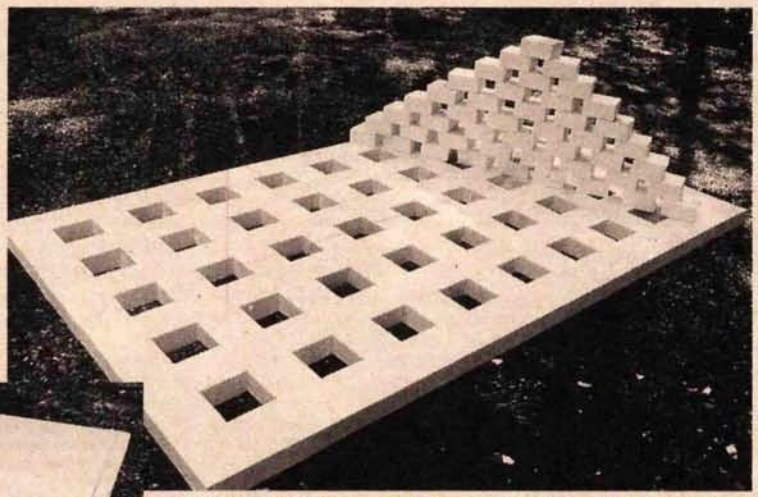
USR&D CORP.

AERO*COMP

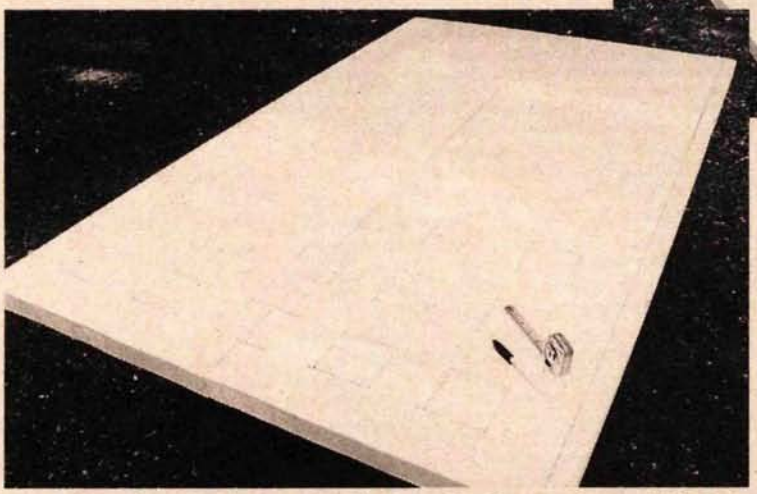
AERO*COMP predicts how well your electric-powered aircraft will perform—before you build it! You input the physical characteristics of the airplane, propellers, motors and battery pack, and the program will tell you takeoff rpm, current, best gear ratio, motor power, efficiency, thrust, rate-of-climb, air speed, glide ratio and other aerodynamic characteristics. Predictions are usually accurate to within 5 percent! It also features easy-to-use pulldown menus, help screens, built-in data for 225 electric motors, built-in data for 53 airfoils and an instruction manual. It runs on all IBMs and compatibles using DOS 2.0 and above. AERO*COMP is used by NASA and by U.S. and Canadian Nationals winners.

Price: $79 ($3 S&H)

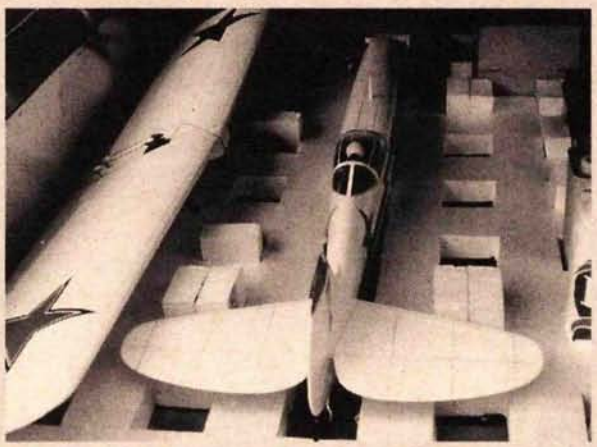
Those folks who use their vehicle for more than just transporting R/C aircraft can remove the grid and leave it hanging on the garage wall until it's time to go flying again. —Faye Stilley



Below: Styrofoam insulation is available in 2x8-foot sections. The bed of my truck measures 76x46 inches, so I used two sections joined at the center. I cut the foam to fit snugly into the bed to ensure that the Styrofoam itself wouldn't slide around. The grid is marked off on the Styrofoam. I used the blue type because it's firmer than the white and as likely to crumble. The foam is 2 inches thick and the pockets are 4 inches square.



Above: This grid provides the most flexibility. You can make a special grid for each aircraft and its accessories and simply glue the locks into place. Because the foam is lightweight, you can easily swap one grid for another.



Right: When I had finished cutting, I had a grid of foam and enough blocks to last for many seasons and to suit many sizes and shapes of aircraft. When turned on their ends and inserted in the pockets, the 4-inch-square blocks protrude 2 inches above the base grid, providing the lock. Use double blocks to frame heavy items. Single blocks work well to lock wheels into place. The locks can be used in many configurations.

INDEX OF MANUFACTURERS

77, 78
ACE R/C
P.O. Box 472
116 W. 19th St.
Higginsville, MO 64037
(816) 584-7121
(816) 584-7766 (fax)

84
AEROPLAN, INC.
14850 N.W. 44th Ct.
Ste. 252
Opa-Locka, FL 33054
(305) 687-0556
(305) 687-4438 (fax)

92
AIRDROME
P.O. Box 1425
F.D.R. Station
New York, NY 10150
(212) 421-1440
(212) 486-1419

90
AIR FLAIR MFG. CO.
P.O. Box 11702
Kansas City, MO 64138
(816) 353-7854

93
AIR GROUP 1
270 N. Canon Dr.
Dept. 1402-AA
Beverly Hills, CA 90210
(310) 550-7280

78
AMERICAN AERO
RR2, Box 62
Edinburg, IL 62531
(217) 623-5772
(217) 623-5772

84
AMERICAN MODEL MANUFACTURING
P.O. Box 105
Mason, MI 48854
(517) 676-4090
(517) 676-6618 (fax)

93
AMERICAN RADIO CONTROL
6526 Bells Ferry Rd.
Woodstock, GA 30188
(404) 516-4208
(404) 928-8932

78
BOB DIVELY MODELS
28001 Chagrin Blvd.
Ste. 206
Woodmere, OH 44122
(216) 292-6926
(216) 292-7153 (fax)

78
BOB PARKINSON MODELS USA
1140 Early Dr. NW
Palm Bay, FL 32907
(407) 726-8401
(407) 725-3381 (fax)

94
BOB SMITH INDUSTRIES
8060 Morro Rd.
Atascadero, CA 93422
(805) 466-1717
(805) 466-3683 (fax)

94
BOB VIOLETT MODELS
170 State Rd. 419
Winter Springs, FL 32708
(407) 327-6333
(407) 327-5020 (fax)

94
BODDEN MODEL PRODUCTS
P.O. Box 8095
Redlands, CA 92375
(909) 793-2514

78
BRADFORD KITS
8416 Racine Rd.
Pleasant Garden, NC 27313
(910) 685-0088

76
BRIDI AIRCRAFT DESIGNS
23625 S. Pineforest Ln.
Harbor City, CA 90710
(310) 326-5013
(310) 549-8268 (fax)

78, 87, 88, 90
BYRON ORIGINALS
P.O. Box 279
Ida Grove, IA 51445
(712) 364-3165
(712) 364-3901

76, 78, 82, 83, 84, 85
CARL GOLDBERG MODELS
4734 W. Chicago Ave.
Chicago, IL 60651
(312) 626-9550
(312) 626-9566 (fax)

92
CHAPIS PLANS
Rt. 5, Box 848
Seaford, DE 19973
(619) 629-6373

83, 94
CHARLIE'S
2828 Cochran St.
Ste. 281
Simi Valley, CA 93065
(805) 584-0125
(805) 584-0792 (fax)

79
CLANCY AVIATION
219 West 2nd Ave.
Mesa, AZ 85210
(602) 649-1534

88, 89
CLARK INDUSTRIES
RR #4
Tottenham, Ont.,
Canada L0G 1W0
(905) 936-2131
(phone and fax)

79
COGSWELL ENGINEERING
2379 Wheatherwood
Corona, CA 91719
(909) 735-8679
(909) 278-3563 (fax)

89
CONCEPT MODELS
2906 Grandview Blvd.
Madison, WI 53713
(608) 271-5687

76
COX PRODUCTS INC.
350 W. Rincon St.
Corona, CA 91720
(909) 278-1282
(909) 278-2981

85
CROWN MODELS
P.O. Box 707
Delavan, IL 61734
(309) 244-7070

76, 79, 81, 84
DIRECT CONNECTION R/C
distributed by Capstone R/C Suppliers
562 W. Schrock Rd.
Westerville, OH 43081
(614) 899-6313
(614) 899-6070 (fax)

83
DODGSON DESIGNS
21230 Damson Rd.
Bothell, WA 98021
(206) 776-8067

94
DREMEL
4915 21st St.
Racine, WI 53406
(414) 554-1390
(414) 554-7654 (fax)

94, 95
DU-BRO PRODUCTS
P.O. Box 815
Wauconda, IL 60084
(708) 526-2136
(708) 526-1604 (fax)

79, 83
ESTES INDUSTRIES
1295 H St.
Penrose, CO 81240
(719) 372-6565
(719) 372-3419 (fax)

95
FLIGHT GROUP 1
270 N. Canon Rd
Dept. 1402-MA
Beverly Hills, CA 90210
(310) 550-7280
(800) 544-4365

76, 81, 82
FUTABA
P.O. Box 19767
Irvine, CA 92713
(714) 455-9888
(714) 455-9899 (fax)

79, 89, 91
GILBERT AIRCRAFT PERFORMANCE PRODUCTS
123 Goodrich St.
Zeeland, MI 49464
(616) 772-1832

79, 80, 82, 85
GREAT PLANES MFG.
distributed by Great Planes Model Distributors

GREAT PLANES MODEL DISTRIBUTORS
P.O. Box 9021
Champaign, IL 61826
(217) 398-6300

89
GTM, INC.
1258 Dogwood Rd.
Snellville, GA 30278
(404) 736-0569

80, 85
HANGAR 1 AVIATION
2705 Airport Rd.
Dalton, GA 30721
(706) 278-1585

80
HANGAR DESIGNS
2 Raccoon Ct.
Jacksonville, AR 72076
(501) 834-8177

80
HIGH T.E.K. MODELS
461 Houseman NE
Grand Rapids, MI 49503
(616) 458-2261

95, 96
HJJ CO., INC.
P.O. Box 60833
Boulder City, NV 89006
(702) 293-2588
(800) 480-3665

76, 82
HOBBICO
distributed by Great Planes Model Distributors

76, 77, 82, 91
HORIZON HOBBY DISTRIBUTORS
4105 Fieldstone Rd.
Champaign, IL 61821
(217) 355-0022

83
ICARE SAILPLANES
381 Joseph-Huet
Boucherville,
Quebec, Canada J4P 2C5
(514) 449-9094

96
JAMES L. WARDROPE ASTRODATA
421 S.W. Blakely Ct.
Bend, OR 97702
(503) 389-2359

96
JDM PRODUCTS
543 Bedford St.
Concord, MA 01742
(508) 369-9212

83, 84
K&A MODELS
6059 Faculty Ave.
Lakewood, CA 90712
(310) 804-0006
(310) 804-5092 (fax)

91
KYOSHO
distributed by Great Planes Model Distributors

91
LITE MACHINES CORP.
1291 Cumberland Ave.
Unit B
W. Lafayette, IN 47906
(317) 463-0959

92
MAECO
2 Cottage Ln.
San Carlos, CA 94070
(415) 593-6669

77, 84
MAJOR HOBBY
1520 "B" Corona Dr.
Lake Havasu City, AZ 86403
(602) 855-7901
(602) 855-5930 (fax)

89
MEISTER SCALE
993-C S. Santa Fe Ave. #184
Santa Vista, CA 92083
(619) 744-8383

97
MR. HOUSEFLY
1008 W. 6th St.
Ida Grove, IA 51445
(712) 364-3596

80
NFS ENTERPRISES
P.O. Box 2254
Crystal River, FL 34423
(904) 563-0894
(800) 780-1819

89
NIMBUS AIRCRAFT CO.
4900 Creekside Dr.
Ste. D
Clearwater, FL 34620
(800) 573-5731

81
NORTHERN WINGS
P.O. Box 40599
Upper Brant Postal Outlet
Burlington, Ont.,
Canada L7P 4W1
(905) 319-9464

84
NSG HOBBIES
P.O. Box 436
Pomona, NY 10970
(914) 362-4375

85
PACIFIC AEROMODEL MFG., INC.
760 Stinson Ave.
City of Industry, CA
(818) 961-4616

91
PALMER PLANS
6047 Pomegranate Ln.
Woodland Hills, CA 91367
(818) 348-0879
(818) 348-9204 (fax)

81
RA CORES
P.O. Box 863
Southbridge, MA 01550
(508) 765-9998

97
RITECO SUPPLY INC.
12999 FM 529
Houston, TX 77041
(713) 896-6200
(713) 896-6200 (fax)

86
ROYAL PRODUCTS CORP.
790 W. Tennessee Ave.
Denver, CO 80223
(303) 778-7711
(303) 778-7711 (fax)

86
TA-KING OFF HOBBIES
15 Bay Shore Dr.
Battle Creek, MI 49017
(616) 964-7917

92
THE CUTTING EDGE
RD3 Box 89
Franklin, PA 16323
(814) 437-1627

77, 81, 84
THUNDER TIGER USA INC.
2430 Lacy Ln., #120
Carrollton, TX 75006
(214) 243-8238
(214) 243-8255 (fax)

86, 87
TOP FLITE
distributed by Great Planes Model Distributors

77, 90
TOP GUN AIRCRAFT
801 Canal St., Wing A
Ottawa, IL 61350
(815) 433-6132
(815) 433-5596 (fax)

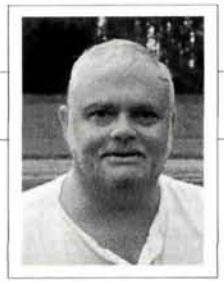
91
TWINN-K, INC.
4770 W. 139th St.
Cleveland, OH 44135
(216) 433-1988
(216) 267-3260 (fax)

89, 90
ULTIMATESPORT R/C
P.O. Box 727
Soda Springs, ID 83276
(208) 547-3742

97
USR&D CORP.
P.O. Box 753
Hackettstown, NJ 07840
(908) 850-4131

77
WINDWARD R/C
20F Hudson Harbor
Poughkeepsie, NY 12601
(914) 485-8346

SPORTY SCALE



FRANK TIANO

PERFORMANCE POWERPLANTS AND MORE

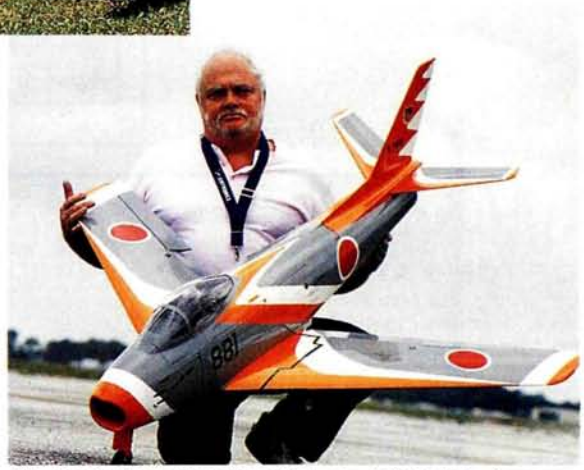
THERE'S AN old saying that leads one to believe that if you ask for something you will receive it. Don't ask me; I haven't a clue how that holds to be true today. However, several months ago, I asked if some of you might like to share photos and stories about what you're building, and I enjoyed the response. We've covered so much here in "Sporty Scale" over the last bazillion issues that I think it's time to re-address some topics. So, with that in mind, if any of you feel you'd like more info on how to do something, even if it has been covered before, fire off a letter to our new editor man Frank Masi, and tell him what you'd like to see. He in turn will rattle my cage and, hopefully, in not too many more issues, you'll see how to do whatever it was that you forgot how!

Bill Hebestriet's Me-109 is a majestic piece of work. Simple and clean details make it ideal for contest work or fly-ins. The normal weight of the Platt kit is between 16 to 18 pounds, and the O.S. 1.08 is the perfect engine for this model.

ZENOAH'S NEW G-45

Here's some interesting good news. Most of you probably know how popular the Zenoah series of gasoline-powered engines is, right? And most realize that they are one of the best values around at this time, right? Well, how about that new G-45 size that they released a few months ago? We've been flying one of these jewels for a while now, and I gotta tell you that this ain't your ordinary 2.7ci motor. No sirree. Jimmy Goad, out at ISC*, brags, I mean boasts, I mean tells me that this is the first Zenoah designed from the bottom up as a no-kidding model-aircraft engine. In other words, they didn't just adopt it from some lake pump, chain saw or tree shredder. Our G-45 turns almost any prop within reason, but really enjoys a 20x8 Zinger* wood or a Dynathrust* composite prop. It happily turns either of those at 8,000rpm or better, which rivals the big glow-fueled SuperTigre 4500. If you're interested, fighter planes weighing 27 pounds or less will have startling performances, and lightly loaded high-wing types, more commonly called "Cubs" and such, will fly very realistically up to 35 pounds! The engine is fairly compact, and the carb mounting has been designed to keep the carb itself as close to the crankcase as possible. Gee, you say, this must be the most perfect engine ever—one

Frankie T's new profile pace plane—Moki-powered and only 17 pounds. It uses an Airtronics 660 Infinity, Platt* gear and is painted with K&B* bright-red epoxy. The speed envelope is from 30 to 160mph.*



Mr. Sporty Scale himself and his new BVM F-86 in Japanese Aerobatic Team colors. It's only 13 pounds and is powered by a BVM .82. The colors are medium gray, international orange and white with red roundels.*

that has no faults! No, Mr. Crooked Cylinder Fins Man, I say, of course it has a fault. This engine's timing is just radical enough that until it's well broken in, you just ain't gonna start it without a spring starter or one of those Miller R/C* babies. After it has been through a few gallons of gas, it will be a little more friendly but still cranky the first time out. But, hey, modelers are used to that stuff. The price of power doesn't come easy.

A Pica ⅛-scale Mustang just naturally builds a bit on the heavy side. Dr. Steve Harris added some extra epoxy paint and found that he needed at least 2.5 cubes to fly it with authority. He chose the SuperTigre 4500 and a 20x8 prop. Flies great!

EASIER STARTS

You know, speaking of starting gasoline engines, by now, most of you have probably seen an ad or two created by CH Electronics* that talks about their new Jump Start System. Actually, I call it a "Kick Starter" cause I like the name better, but that's a whole 'nother story. Anyhow, Bill Carpenter—the C of CH—devised a neat little doodad that hooks up to your Zenoah in a matter of minutes and retards the timing so that the engine starts really easily by hand-propping or with the slightest nudge from a spring starter. It uses an outside battery pack—typically a 4.8V receiver battery and an audio jack kinda thing. To start the engine, just do the normal procedures, and watch the engine come to life almost instantly. By the way, for those who wonder what's the easy method for starting a gas engine that doesn't benefit from an ignition system, here it is. First, with the kill switch in the "on" position and the radio on, go to full throttle and either close the choke or have someone hold his finger over the carb opening while you or one of your designated helpers flips the prop smartly until you hear the engine try to start. Something like "bIIvroolImb." Once someone in the gang is certain the engine did indeed try to start, open the choke again, or remove the finger from the carb intake, and set the throttle at idle. Now flip the prop smartly, or use the spring starter and, within a couple of go-arounds, the engine will fire. Absolutely, I promise. If it doesn't for *any* reason, do not call me. Call Bill Carpenter at CH Electronics, and buy one of those Kick Starts or Jump Starts. Incidentally, they're available for a lot of engines and cost a mere $59.95 and, for an additional double sawbuck, they'll even mount it to your engine for you! What a country.

Ruben Ramos shows us his fabulous Bates Bearcat powered by the O.S. 3500. It uses Bulldog Bearcat gear, Barton* wheels and has an epoxy finish. It's only 22 pounds, and Ruben says it flies like a dream!*

HIGHLIGHT OF THE MONTH

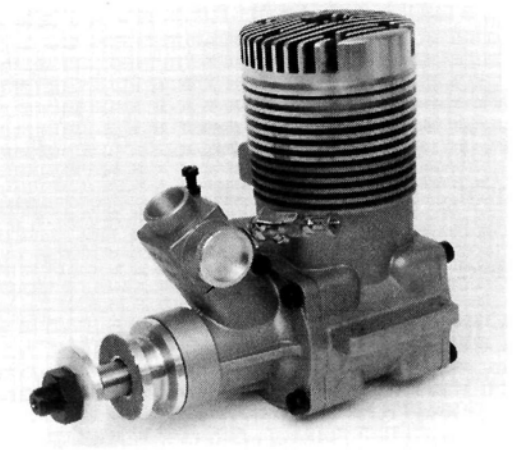
You'll notice that one of the pictures we are featuring this month is that of Bill Hebestriet's dandy-looking Me-109, which he built over the past three years of part-time picking. Picking means that the project is somewhere near the back burner in the list of models to complete, but not close enough to even get warm. Anyway, normally, we just caption the photo with the particulars like engine size, kit manufacturer and wingspan. But Bill's 109 is just different enough to warrant this brief paragraph. Yes, it's a Dave Platt kit and, yes, it's very scale. But it has scale flaps and functioning slats! And that's as far as I'm going to take you on this. If you'd like more info and maybe even a diagram on how Bill got the mess to work, you can reach him at Box 3891, Wofford Hts., CA 93285. Trust me, it's ingenious—neat and not as tricky as you might think.

TONY'S TACHOMETER

There's a man who lives in Woodstock, NY, who is making quite a name for himself lately with the competition kinda guys who need specially designed electronics for their models. His name is Tony Criscimagna*, he's a retired IBM electronics engineer and is responsible for designing, single-handedly, the IBM perpetual lead-pencil/flashlight combination that many of you have come to know and love. In the past, Tony has designed electric delayed door closures for Mark Frankel and Bob Boswell. Lately, he has designed the world's most accurate tachometer—one with a plus or minus error of only 100 at a staggering 150,000rpm! In other words, it's damn close. Best of all, this tach reads a 2- or 3-blade prop from as far away as 5 feet and reads in almost complete darkness. And even better yet is that Tony has taken this futuristic concept one step further and come up with an accurate tachometer for ducted fans. It's pretty common knowledge that regular tachs don't work well with ducted fans because the fan blades are usually located deep within the innards of the fuselage (in a poorly lit place, to say the least). Common tachs need lots of light to operate and are happiest when their photo

sensors are located near the rotating blades. These conditions aren't normally present in a jet model.

Tony's Tach, as I will call it, has been developed so that a remote optical sensor can be positioned inside the fan installation, together with a tiny light source to illuminate the spinner. A small multi-wire cable is provided to connect that light source and the photo sensor sitting next to it to a special plug mounted somewhere inside the model. To read the rpm of the fan, plug one end of a special wire into the tach and the other end into the plug located in the fuselage. Bingo, read the tach! The entire installation is very simple, and the only modification you must make to your fan is to paint a couple of white stripes on the spinner so the sensor can read the revs. If you find yourself flying a prop job as well as your jet, Tony offers a tiny plug-in module that allows the tach to read prop rpm as well. What a deal! We had the opportunity to check Tony's work, and we've made a couple of suggestions to make his units even more user-friendly. To date, he has taken not only our advice but also that of several others who have been testing the tach in everyday operations. I'll go out on a limb and say that even though it's almost twice as much dough as some others, this tach is something to use! Just the advantage of being able to get an rpm reading from 4 feet behind the prop, regardless of lighting conditions, makes it certainly worth considering!



Here's a look at the compact Moki 1.8ci glow engine for large scale models. Notice how they've thoughtfully placed the needle valve out of the way. Robust and powerful, it's the new kid on the block—a real tough guy!

MOKI'S BIG GUN

One more engine comment this month, and I'm outta here. It's no secret that glow engines in the 1.8 to 2.2ci. size range are used quite extensively in scale modeling. There are several available like the SuperTigre* 3000 and the OPS* Maxi, both at 1.8 cubes, and the discontinued Webra* Bully and current O.S.* 3500 at 2.2 cubes—the most well-known. All four engines seem to prefer an 18x8 prop for best performance, although all can be loaded up to a 20x6 or 20x8. Normally, we would look for aircraft weights somewhere between 18 to 35 pounds—aerobatic ships being lighter, fighter types being in the middle and civilian types the heaviest. Until recently, the Moki* 1.8 seemed to take a back seat to the other four, possibly because many thought the engine was designed expressly for racing. Not true, "nitro breath"! The Moki 1.8 is a true powerhouse, yes, but one that loves to power scale models. This engine is not only a bear but it's also really quite friendly to boot. It handles well and is very easy to start. Where it excels, as far as I'm concerned, is that it can turn any prop from a 14x14 up to a 20x8 with great results. It is not prone to overheating as long as the normal precautions are taken, and the engine just gets better and better with every tankful. One noteworthy fact: even though this engine is the same size as the SuperTigre 3000, it requires more oil for proper operation. So make sure there's at least 18 percent oil in your

(Continued on page 155)

Roy's L-5 takes off on another cold-weather flight. Because of the additional drag caused by the skis, takeoffs and landings require a little more power.

HOW TO

Make Giant-Scale Skis

Flying off snow made easy

by ROY VAILLANCOURT

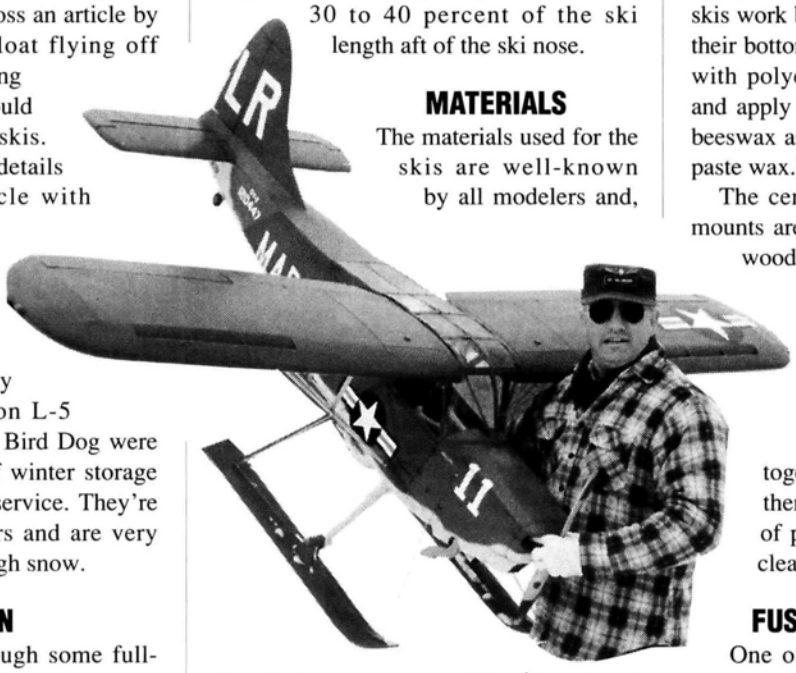
WHILE READING *Sport Flying*—the January 1994 *Model Airplane News* special—I came across an article by Chris Chianelli about float flying off water. It started me thinking about how much fun it would be to fly off snow with skis. After working out some details about writing this article with associate editor Gerry Yarrish, I started.

First, I had to pick some suitable subjects to modify for ski installation. That was the easy part, because my Stinson L-5 Sentinel and Cessna L-19 Bird Dog were just begging to get out of winter storage and be drafted back into service. They're both ¼-scale tail-draggers and are very suitable for trudging through snow.

SKI DESIGN

During a quick look through some full-size-aviation magazines, I came across a short article about winter flying—with skis. This article contained some neat color photos of two Piper J-3 Cubs—probably the most common aircraft—outfitted with different brands of ski, and this supplied me with a few ideas on designing a simple yet effective set of skis for my ¼-scale models.

I generated full-size drawings for the skis following the tried-and-true "That-looks-about-right" formula (good old eyeball engineering!). After measuring the skis and fuselages in the photos, I calculated their comparative lengths, and I used these figures to plan the dimensions of my skis. The length of the skis should be approximately 50 percent of the fuselage length, and the axle pivot point should be 30 to 40 percent of the ski length aft of the ski nose.



Roy Vaillancourt shows off the ¼-scale, ski-equipped Stinson L-5 Sentinel, which he designed. It's powered by a Quadra Q-42.

MATERIALS

The materials used for the skis are well-known by all modelers and, depending on the weight of your model, the skis can be made of ⅛-, 3/16- or ¼-inch-thick lite-ply or lauan (the plywood material used to skin interior household doors). For models that weigh up to about 15 pounds, use ⅛-inch-thick material; models of 25 pounds or more can take ¼-inch-thick material.

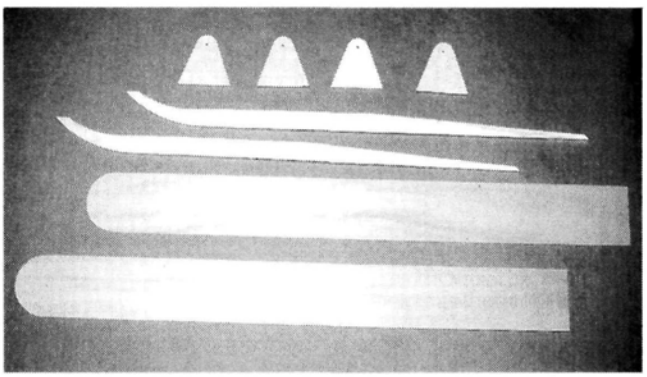
Metal skis mean trouble because snow really likes to stick to cold metal. Wooden skis work better; just be sure that you sand their bottoms silky smooth, seal them well with polyester resin, polyurethane, etc., and apply wax. (We've successfully used beeswax as well as high-grade automotive paste wax.)

The center stiffener and the two axle mounts are made of various types of plywood. For ¼-scale models, the stiffener is ½-inch-thick exterior-grade house-construction plywood, and the two axle mounts are ¼-inch-thick aircraft plywood.

The entire assembly is glued together with 12-minute epoxy and then painted with a couple of coats of paint and topped off with some clear polyurethane or epoxy.

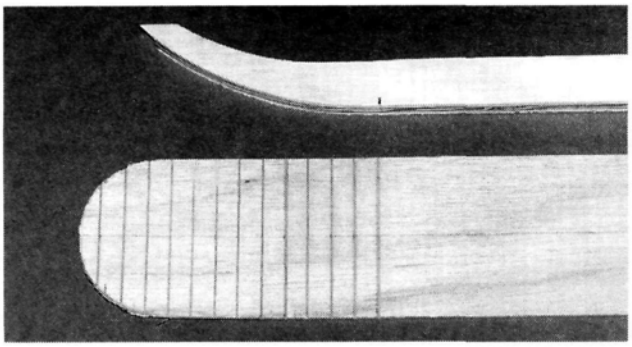
FUSELAGE CONSIDERATIONS

One of the neatest things about this design is the ease with which you can switch from wheels to skis. This is very important when you get that unexpected



Here are all the wooden parts for one set of skis (see text for details).

PHOTOS BY ROY VAILLANCOURT



To bend the front of the ski upward to match the curve of the center stiffener, a series of cuts is made in the ski's top surface.

Here, all the parts are clamped together while the adhesives dry.

snowfall and last-minute calls from your flying buddies to meet them at the field. It takes only a few minutes to change from wheels to skis.

Only one modification is needed: install two pairs of eyehooks on the fuselage to act as attachment points. Install two in front of the landing gear—one on each side. You'll attach the skis' nose bungees to these (more on this later). The other two go aft of the landing gear; the rear extension limiting cables will be attached to them. I simply epoxied some hardwood blocks inside the fuselage and permanently screwed the eyehooks into place (see photos).

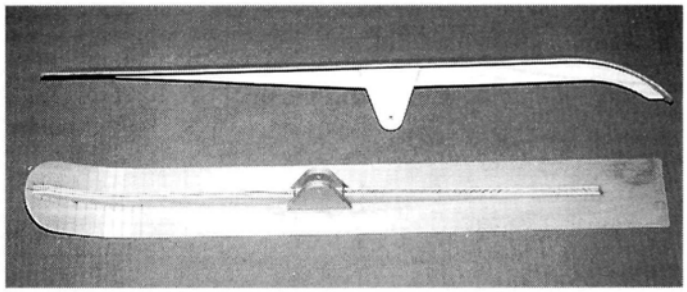
SKI SETUP

To set up your skis properly, there are two basic yet important alignments to maintain.

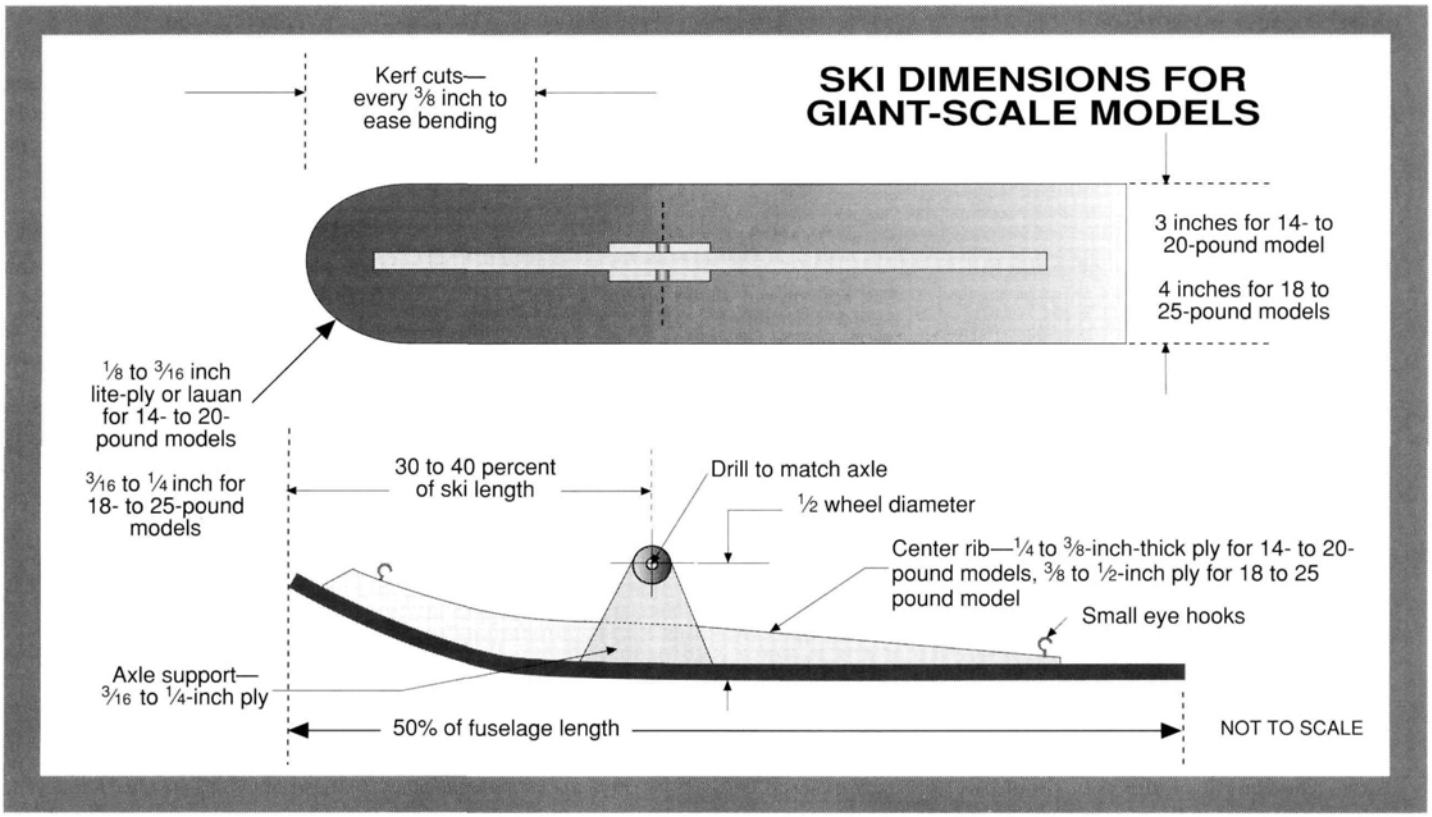
- **Toe-in.** The skis must be parallel to each another as well as to the fuselage center line (a function of the landing gear's axle toe-in adjustment).
- **Angle of attack.** The skis' angle of attack must be approximately 10 degrees positive while the aircraft is in flight (a function of the bungee and limiting-cable adjustments).

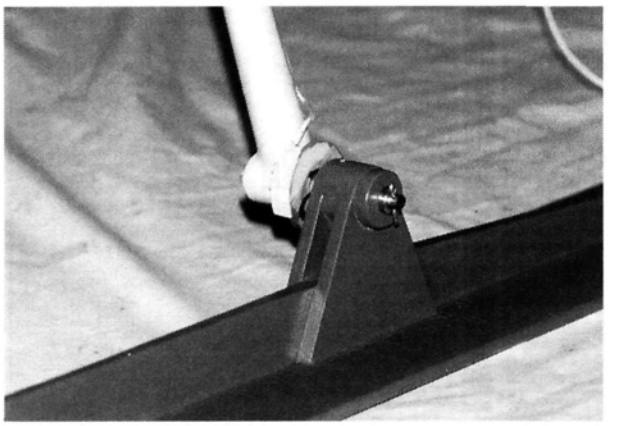
The nose bungees are big rubber bands that lift the tips of the skis. To limit how high the ski noses rise, you adjust the lengths of the rear limiting cables. I like to make these adjustments on the workbench with the skis mounted on the axles (held in place with wheel collars) and the airplane's tail propped up. To get the required 10 degrees of ski nose-up in a flight attitude, I keep the skis flat on the bench and raise the tail so that the plane's nose is set at a flight attitude of negative 10 degrees.

When you lift the model off the bench, if you've set everything up properly, the

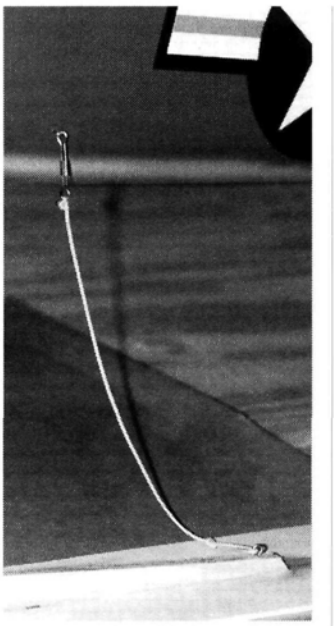


A finished set of skis, ready for painting.

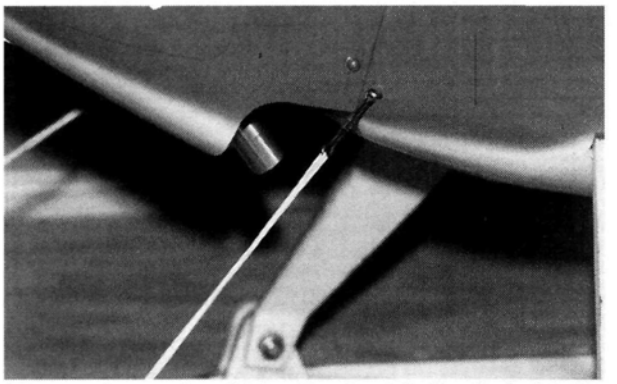




After the paint has dried, filler pieces are added to and between the uprights so that the attachment point is the same width as the axle's original wheel hub. The cotter pin can be removed quickly—very convenient.



The rear limiting cable is really 50-pound test mason line; it's attached with metal eyehooks and a control-line connector.



The nose bungee is a thick rubber band that's attached to the ski's nose and also to the fuselage with a metal eyehook. The line connector is from my control-line flying days.

bungees will lift the noses of the skis and make the limiting cable taut. When the model is placed on the ground, the cables should slacken and the skis should lie flat. It's important that they also be able to pivot freely on the axles.

To make it easy to attach the bungees and cables, I install line connectors or some other type of "quick-disconnect" device at the fuselage attachment points. Old control-line connectors work well; you might find similar connectors in a fishing-tackle store.

To make it easier to remove the wheels from my models, I've replaced the usual wheel collars with cotter pins that go into small holes drilled through the end of the axles.

TIPS ON SNOW FLYING

With all the shop work finished, it's time to head for the field. The toughest part is waiting for the snow! I live on Long Island, NY, and we don't usually get much snow, but last winter, the snow made it difficult to get to the field! When the Snow Bird Squadron—John Julian, Mike Gross and me—at last managed it, we enjoyed really great, off-ski flights.

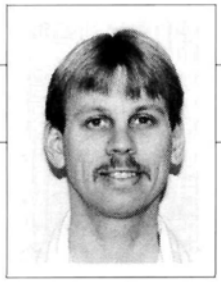
When flying off snow, remember these tips:

- Apply slightly more power to taxi. If you have no ski attached to the tail wheel, the rudder will also need a blast of power for turning.
- You'll need more power for takeoff, and the skis will have to plane on the snow before you'll be able to build up air speed. To overcome torque, apply the throttle gradually and smoothly (just as if you were flying off a green runway). Equipped with skis, your model will not fly as fast because skis increase drag.
- Increase power during landings, and use a slightly nose-high, three-point, or wheel-landing, approach to keep the tips of the skis up. For short-field operations with my L-5, I particularly like the "I have arrived, three-point, *plop* type of landing."

Using scale snow skis is a really easy way to extend your flying season. Just dress warmly and take along some hot coffee.

Using scale snow skis is a really easy way to extend your flying season. Just dress warmly and take along some hot coffee; you don't want frost-bitten flying thumbs. Enjoy! ■

CENTER ON LIFT



MICHAEL LACHOWSKI

BUILDING TIPS

SINCE IT'S the building season, let's talk about construction techniques and radio installations. Epoxy is the primary adhesive that most builders use to attach wing sheeting and to glue composites. It's also an easy way to add several ounces of unnecessary weight if too much epoxy is used. I'll share some ideas and techniques for reducing the amount of epoxy needed to do the job. After completing your model, you will need to install a radio. I also want to tell you about a device that can measure the current draw of the servos so that you can make sure your linkages operate smoothly.

LIGHTER CARBON-FIBER CLOTH

Lightweight composite cloths give us new construction options, including models we would have never considered building. Kennedy Composites* is one of a number of suppliers that keep finding new and unique materials for model builders. One item I first noticed at the World Soaring Jamboree is 1.5-ounce unidirectional carbon fiber. Previously, the lightest cloth available was 2.5 ounce (most of you are familiar with 3.5 cloth). The lightweight, 1.5-ounce cloth is made of 1K carbon tows, which are very thin. The resulting cloth is smooth and even, without any gaps.

I have some of this cloth, but haven't used it yet. My plan is to use it in a hand-launch glider to produce stiffer wings. Instead of running fiberglass tape under the sheeting, I'll use strips of this carbon fiber at the high point on the airfoil, on the trailing edge, and near the leading edge, to help survive midairs.

EASY ON THE EPOXY

Some people have problems using epoxy and composites to make a lightweight model. The basic reason is too much epoxy. If you apply the epoxy on either the wood sheeting or the foam, excess epoxy fills all the voids and gaps. This can add up to several ounces on a wing. Fortunately, there are several ways to approach this problem.

The first thing you can do is get some tint for the epoxy so you can see it on the wood. You can find dyes in craft/hobby shops that sell materials for casting small items out of epoxy or polyester. Apply a small amount of epoxy to the wooden skins, and spread it out before putting any more on the wood. If you just pour a bunch onto the wood, it will sit there and soak in before you get to spread the epoxy.

You can apply a sealer to the inside surface of the sheeting before gluing the sheeting down. This seals the wood and reduces the amount of epoxy that soaks in. For obechi, apply a coat of clear polyurethane. The epoxy can be thickened with Aerosil* as an additional measure. The filler is lighter than the epoxy, and this reduces the weight of the glue.

UNDER THE SHEETING

Frequently, we apply fiberglass or carbon-fiber cloth under the wing sheeting to add strength. To save weight and control the amount of epoxy used, you need

Saving Weight when Sheeting with Epoxy

- Don't pour large amounts of epoxy on bare wood. Excess epoxy soaks in and adds weight.
- Wet out cloth on a carrier sheet to avoid using excess epoxy.
- If you can't see the epoxy on the wood, use a dye or a tint to see where you've applied the epoxy.
- Seal the surface of the wood to reduce the amount of epoxy soaking into the wood.

HOBBY-TEC SYSTEM ANALYSIS METER

How good is your control linkage? Are your surfaces binding? Poor linkages cause servos to work overtime, drawing extra current and reducing battery life. It might even result in a crash if your batteries get too low in flight.

One way to check your linkage is to measure the current draw of your servos. This requires a meter to measure the current. Hobby-tec* makes a nice little unit—the System Analysis Meter—that you can use to test the health of your servos and determine whether you have any linkage problems. The unit comes with a complete set of instructions. You don't get a readout to the nearest milliamp, but that isn't what you need. All that is needed is a ballpark figure to tell if the servo is OK, overloaded, or stalled. This device provides this information in an easy-to-read, color-coded, analog readout.

Hook the meter to your wiring harness, and slowly operate each control surface. Look for overload currents or stalled servos, i.e., where the dial swings over the yellow or red bar, and also check current levels at your endpoints. You'll see the dial in the green when the servos are working efficiently, and it will be immediately obvious if a control surface binds or a servo is stalled.

Measure the current with a pushrod attached and detached. If the current greatly increases after attaching the pushrod, there is something wrong with your linkage that you need to fix.

to wet out the cloth on a plastic carrier sheet before applying it to the wing. Carbon fiber is especially prone to soaking up too much epoxy while it is being wetted out. If you wet it out directly over wood sheeting, much of the epoxy will soak into the wood. This extra step takes time, but unless you have cloth that already has epoxy on it, you should wet it out on a carrier sheet to control the amount of epoxy in the cloth.

CARRYING EPOXY WITH GLASS

Lightweight fiberglass cloth can also be an efficient carrier medium for the application of epoxy. The epoxy held by the cloth is enough to glue on wing sheeting. For an HLG, use the lightest cloth you can find, and all you have to do with the sheeting is tape the sheets together. No edge gluing is necessary. Simply wet out the fiberglass on plastic or wax paper, transfer the fiberglass to the sheeting, and bag your wing. The glass should look almost dry with no smooth, shiny areas of excess epoxy. Use some paper towels to pull out any excess epoxy before transferring the fiberglass to the sheeting.

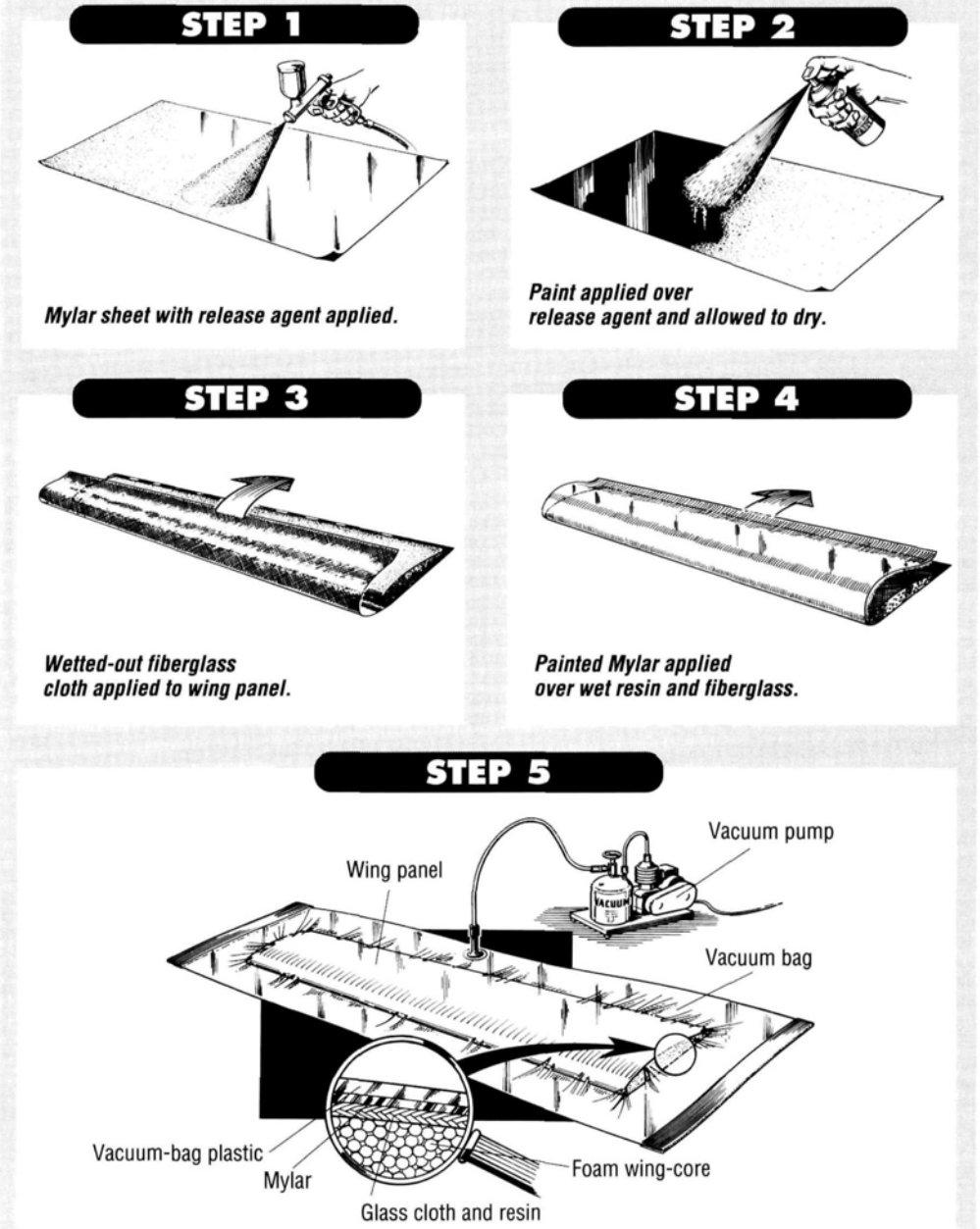
TRANSFERRING A PAINT FINISH

I've also used this technique to transfer a paint finish to a wing. Prepare the Mylar with a release agent just as you would for conventional vacuum-bagging. Now spray-paint the Mylar, using successive light coats. Since the Mylar is clear, you can easily see how thick a coat of paint is by how opaque the paint makes the Mylar. Remember, excess paint is excess weight.

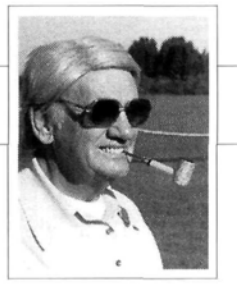
After the paint has dried, cut some light fiberglass cloth. I use 1.4-ounce or ¾-ounce cloth and cut it on a 45-degree bias. Your wooden wing should be sanded smooth, and all the holes and dings filled. Any imperfections will show up later. Wet out the fiberglass, and bag (fiberglass on top of wood) the outside of your wooden wing. After it has cured, you will only need to work on cleaning up the wing's leading edge. With a minimum of paint and epoxy, this finishing system is actually lighter than most film coverings! For an obechi wing, the 45-degree fiberglass adds extra torsional strength.

Try these techniques; they'll help you build lighter, stronger sailplane wings. Till next month.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■



Mylar-covered wing sealed into a vacuum bag for curing.



HAL DeBOLT

BYGONE BIPLANES

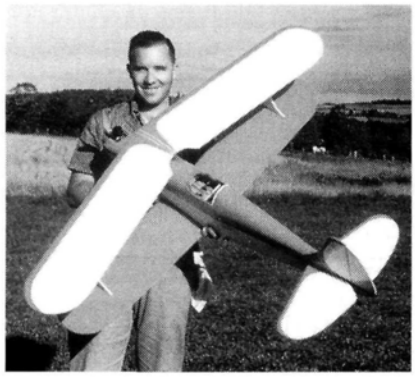
HAVE YOU noticed that biplanes have suddenly burst onto the R/C pattern scene and have done well? Do you ever wonder how bipes started? Let's look into it....

The first R/C biplane of note was probably Bill Northrup's Big John, which was large, even by today's standards. Powered by a .60 engine and using a reed system, it was an excellent sport flier. Although I doubt that Bill ever considered it a contest machine, it did emphasize the practicality of using two wings.

Hal deBolt and Marty Sehl display a bit of biplane evolution. Left to right: a smaller Custom, used for pylon racing; Marty's LW Super Cub bipe (with a second wing like the Senior bipe's); the competition version of the LW Custom (note the addition of wing flaps).

There were two outstanding problems in the early reed days. First, because you wanted slow flight to allow thinking time, you needed to use low power. Second, the plane had a heavy R/C system (1½ pounds or more), so you needed a rugged airframe (to stand abuse); unlike today's electric-powered planes, a light structure would not have been adequate. The needs were met by using a low wing loading, which, for monoplanes, meant increased wing size. Remember that the loading area is weight versus area. So, how do you get the necessary area into a compact size? You simply add another wing—and make a biplane.

Because the second wing added the necessary area, the plane's overall size could be smaller. Compared with a monoplane, a bipe of equal wing area could be three quarters the size. In addition, because the wing's length and span are relative to the plane's size, the smaller all of these can be made, the lighter the plane will be; the lighter the plane is, the tighter the maneuvers can be.



Bob Noll of the Endicott, NY, Aeroguidance Society displays his fine-performing Aeromaster.

COMBINING IDEAS

When the biplane idea struck, it needed to be explored simply. I added a Live Wire (LW) Trainer wing to the bottom of a LW Senior that happened to be available. Flight results were immediately impressive; although normal flight remained similar to the mono's, maneuvers came more easily and with less speed loss. All the changes were positive. Several of these Senior bipes were built, and all demonstrated improved performance. I was amazed that doubling a mono design's wing area didn't lead to instability or any other drawbacks. This certainly looked like a great way to add the necessary area without increasing the plane's size—and at a considerably lower weight than a monoplane of similar area would need.

I should add here, that while work was being done on the biplane, the Over and Under project was proving the value of symmetrical airfoils for aerobatics. So, at the drafting table, the objective was to combine the biplane concept with the symmetrical airfoils to get the best of both. New ideas were coming at us fast in those days!

In the mid-'50s, a LW Cruiser bipe belonging to Bob Mosher of San Antonio, TX, climbs away and flies well.

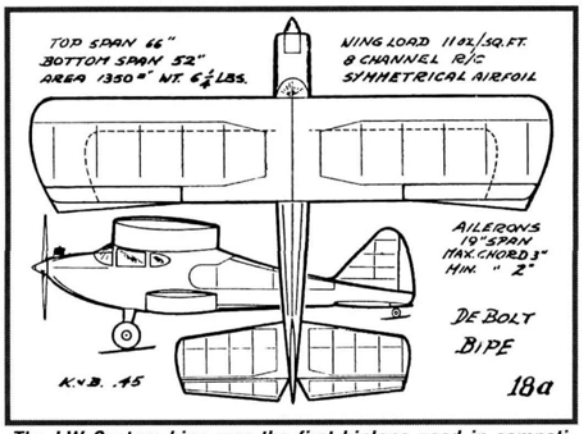
NEW FEATURES

Considering the need for slow flight, .35 engines were the largest being used. Since the Senior bipe did well with a .19, it seemed logical that a .35 in a similar-size craft should be more than adequate. This was an exciting design time—so many new factors to put together!

When we created designs to use for aerobatics, we knew that the large top wing was adequate for all normal flight and that the second wing would only add to aerobatics capability. A symmetrical airfoil produces the least drag when it isn't lifting, and it doesn't produce lift at a zero angle of attack. Because it's best to keep drag to a minimum, the

lower wing was set at the zero angle. The additional lift would occur only when the angle of attack was increased during maneuvers.

The result of our endeavors became the Live Wire Custom bipe. Knowing now of its success, it's hard to comprehend the apprehension we felt when we were creating the design with its radical new features. When the prototype settled in for its first flight landing, our deadpan seriousness changed into ear-to-ear grins; the plane was everything we had hoped for!



The LW Custom bipe was the first biplane used in competition. Flown with a reed system, it was competitive from 1956 through 1960.

THE BEGINNING

The plane's first contest went well; it soared to within ½ point of first place at the Nats. (Perhaps it was helped a bit by a Navy judge who declared, "Real aircraft have two wings!")

My involvement with the development of the Custom bipe continued for a couple of years. A noticeable change during that time was a switch from the scale-looking nose to one that flowed smoothly into a spinner to reduce drag.

Meanwhile, a perplexing problem popped up. Back in those days, we attached the wings with rubber bands. With the bipe, when the rubber band did not have enough tension, the load imposed on the lower wing during maneuvers caused the wing to "rock" in its saddle, with one tip rising toward the upper wing, sometimes slapping it (spectacular to see, but it never created any particular problem). To fix this we used two 1/16-inch-diameter wires outboard to connect the struts, with a little tension between the wings. The idea worked magnificently.

AEROTROL, THE BEGINNING

Because so many fliers say that their first R/C system was an Aerotrol, it seems prudent that I explain where that catchy name came from. Basically, the Aerotrol was the first mass-produced R/C system, and it provided one control. It did have shortcomings, but it got many planes into the air for the first time.

The Aerotrol was the brainchild of Ed Lorenz (then R/C editor of *Model Airplane News*), and was produced by Bill Effinger's Berkeley Model Co. What's amazing is that the complete system, ready to install, cost less than $50; or you could have it in kit form for much less! Remember, building electronics was a part of R/C back then.

The Aerotrol was marketed before the citizens-band opened up, so it was not crystal-controlled, as it is today. When it first came out, you had to peak the transmitter frequency, which was usually on the ham band, and then tune the receiver to that peaked output. The TX used a dipole antenna that comprised a couple of sticks arranged in a "V" shape, with about 10 feet of antenna wire strung between the ends. The "V" was then attached to a 6-foot post that had to be able to rotate. Usually, the TX was attached to the post and had a signaling switch at the end of an extension cord. Because each day's setup would vary, you had to peak-tune the transmitter on each outing, so you had to tune the receiver as well. When you flew the plane, the dipole had to be constantly oriented to face the model; power and reception were at a minimum!

Berkeley Model's Super Aerotrol catalogue sheet. Berkeley was the first to offer complete systems (with everything except dry batteries). Other offerings tended to be piecemeal—missing a transmitter or receiver, escapement, etc.

The receiver required an RK-61 gas tube that, like a dry battery, constantly depleted itself. Replacing a dead tube was a major effort, even for an electronics type.

Fortunately, when everything was in order, we managed to get some controlled flights that greatly whetted our appetites for even more!

When CB came alive, Berkeley offered the Super Aerotrol, which was crystal-controlled (minimum tuning) and featured a hand-held transmitter that eliminated the need for the cumbersome dipole. By this time, many others offered similar systems, and Berkeley's monopoly was over.

So, how about it; does anyone have some juicy Aerotrol experiences to share?

STEERING AND MANEUVERS

In its original configuration, the Custom was flown with only rudder, elevator and engine control; steering and rolling maneuvers were accomplished with the rudder. This design produced tight rolls, but they were still of the "barrel" variety.

At the '57 Nats, where Bob Dunham used ailerons on his Smog Hog, it became obvious that the aileron's time had come. A new upper wing that incorporated ailerons was built for the Custom. With this new addition, the bipe could perform axial rolls with the best; it was impressive even by today's standards.

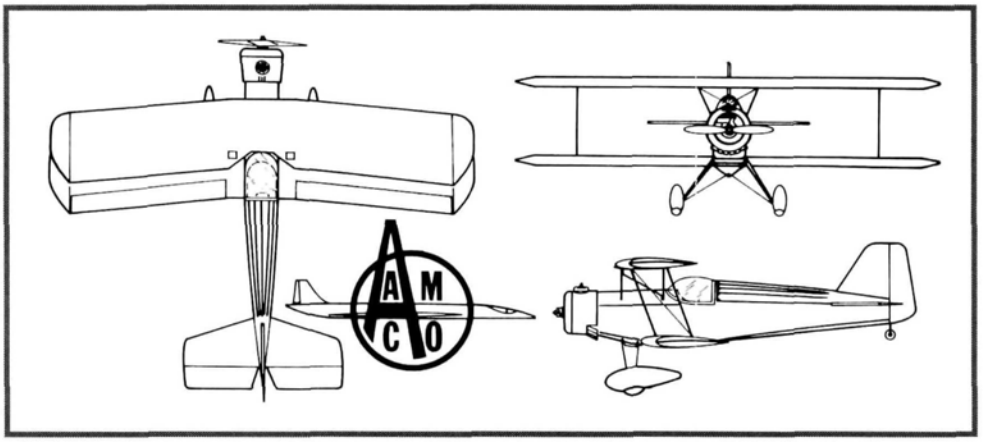
Because of the plane's wing area, the additional weight (of a larger receiver, servo, etc.), had little effect on the wing loading. The weight did, however, affect the power loading, but a .45 engine solved that problem.

Hal deBolt's world championship bipe entry (Zurich 1960); it's smaller—at 900 square inches—and has Bramco reeds and a .35 engine. The photo is of a current replica.

Adding the ailerons did create a problem that persists to this day. Since ailerons should be light, a built-up structure was used. You can imagine the surprise when the use of full speed caused that all-too-familiar (today) flutter! What could be done? Experience with full-scale planes suggested the need for a counterbalance, but that would be complex. The question was, what caused the flutter? One suggestion was that the ailerons were in harmony with the engine's vibration at full speed—harmonic vibration—which, as we found out, was true. Fortunately, the flutter was controlled by simply adding weight to the aileron trailing edges to change the harmonic vibration. (This solution might be applicable in some cases today.)

I should probably note that, when ailerons were first added, we were accustomed to steering with the rudder, so we continued to do so; the ailerons were used solely for rolling maneuvers. It was only when the low wings arrived that ailerons were used for steering.

LW Custom specifications: top wingspan—65 inches; bottom wingspan—52 inches; wing area—1,300 square inches; weight—6 pounds; wing loading—11 ounces/square foot; power—K&B .35 or .45; radio—Bramco reeds.



The Andrews Aeromaster of the late '60s was an immediate success, and the kit remains in production to this day.

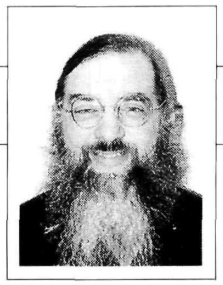
AEROMASTER

In the '60s, another biplane arrived on the scene, and its longevity has become incomparable. Ernie Huber (of helicopter fame) began campaigning with Lou Andrews' Aeromaster and gained it considerable renown. The Aeromaster's design was much closer to today's design for two-wingers—brutish looks and a belching .60 for power. And it had no muffler! Someone once said that the Aeromaster reminded him of a Stearman—a "real man's" aircraft! Surely you're familiar with the Aeromaster; Andrews' kits always sold well, and a modernized version is still available from Great Planes Model Distributors [P.O. Box 9021, Champaign, IL 61826; (217) 398-3630].

FINAL THOUGHTS

So that's how the two-wingers started. It seems strange that these planes had a 30-year hiatus before the Ultimate and Weeks Special brought them back onto the scene. How does it go? You can't keep a good thing hidden forever?

It's interesting to see how the popular modern biplanes compare with the older models. A big difference seems to be that the newer ones don't take advantage of the low wing loading made possible by the use of a second wing. The modern biplane can be closely compared with a typical pattern-style monoplane; both have about 900-square-inch areas and weigh about 9 pounds. That's a 23-ounce-per-square-foot wing loading, which is double that of the OT'er. As with the mono, success comes through the use of substantial power. ■



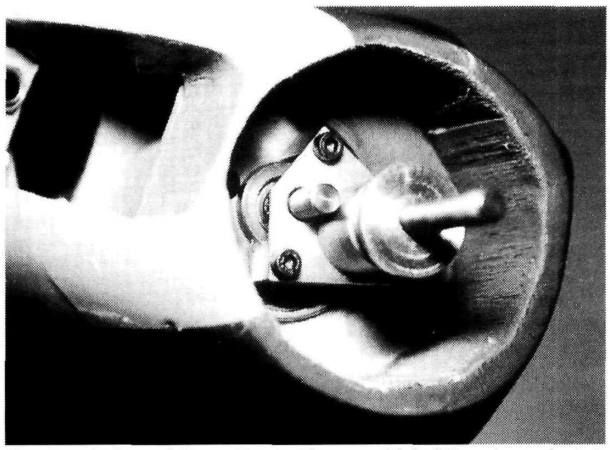
KEITH SHAW

MOUNTING MOTORS

I THINK THAT ONE of the stumbling blocks to the acceptance of electric power is the lack of "common knowledge" on how to do sometimes-simple tasks. If you show up at a typical flying field and ask how to install a fuel tank or mount an engine, 20 eager people will line up to draw sketches and to describe their favorite way to do it. All will be reasonably valid, and some downright clever. This is because everyone faced this problem on the learning curve, and there are so many modelers doing it that it has become common knowledge and is considered easy and logical.

However, if a modeler shows up and asks how to install an electric motor, wire up a power harness, or solder together a Ni-Cd pack, the standard reactions are blank stares, shrugged shoulders, or admonitions that these tasks require five advanced degrees, a magic wand and the assistance of a wizard or three. These tasks are no more difficult, it's just that there isn't the vast common knowledge base yet. The goal of these articles is to help "seed" an information base for electric power, although I realize that these topics may have been covered by others before.

This month's task is the mounting of an electric motor. Even though there are a number of commercial mounts available, and many home-brew ideas, I'll try to point out the strengths and limitations of each so that you can choose the method suitable for your needs. Many mounting methods were developed for the small, low-performance ferrite motors, and these are acceptable in that environment, but are woefully inadequate (and perhaps even dangerous) for larger power systems.



Front-end view of the author's 12-year-old Spitfire shows installation of a geared Astro 40.

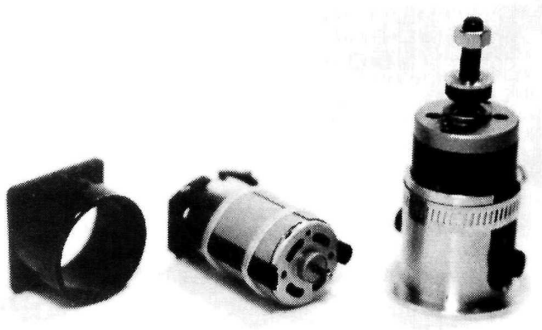
LIMITATIONS AND CONCERNS

Most of my aircraft are high-performance scale or aerobatic types, so I look for streamlined, strong, long-lasting mounting methods designed for a specific power plant. If you are constantly swapping motors for experimentation or maintenance purposes, some of my criteria will be invalid for your use.

The biggest reservation I have with most techniques is the soft flexibility of the mount. As an airplane goes through aerobatic maneuvers, there are some very large forces (due to gyroscopic precession of the prop and motor) trying to twist the motor out of its mount. While using rubber bands or tie-wraps may be crude but tolerable for a 100W ferrite motor in a fluffy sport plane, they would be disastrous for anything much above the 300W range. Also, these soft mounts can leave you wide-open for a bent shaft—the E-flier's nemesis. Later in this article, I will discuss how to mount a motor to virtually eliminate bent shafts and broken props on even hand-launched aircraft, without having to resort to a folding prop. Folders are perfect for gliders, but are inefficient for higher speed aircraft, look absolutely silly on a scale plane and go through some pretty scary oscillations during aerobatics.

COMMERCIAL MOTOR MOUNTS

I believe the first motor mounts available were made by Astro Flight* during the late '70s. Consisting of a molded plastic "tube with ears," a wide variety are now available to fit virtually all Astro motors. They work well for aircraft designs that use a firewall configuration. The motor is prevented from sliding or rotating in the tube by a small setscrew, and while I find this okay on small- to medium-size motors, somewhere around 300-400 watts, the "grab" of the setscrew is not good enough to keep the motor in place. Joe Pasquito* offers a set of very nicely machined, sturdy mounts for even the largest Astro Flight motors that are designed to overcome this limitation. Sonic Tronics* has a clever, adjustable mount that will fit virtually any low-power motor. There are several commercial mounts that look like refugees from the glow-powered camp which are too



Here are some examples of commercially available motor mounts (left to right): Astro Flight, Sonic Tronics, Joe Pasquito.

bulky or heavy for serious use, but might be acceptable for the casual sport flier.

PREVENTING THE BENT-SHAFT TERROR

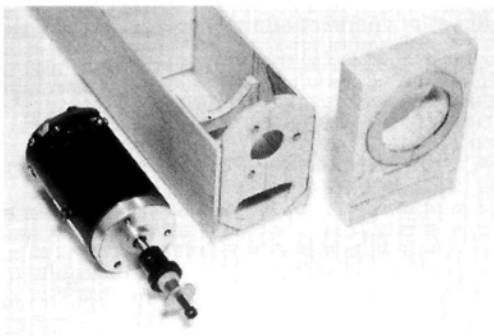
Many materials, including metals, are "elastic" over modest deflection. That is, when they are flexed slightly, they will return to their original shape when the force is removed. Every metal has an elastic limit, after which a permanent bend or kink will occur. If we use a motor mounting method that keeps any deflection under the elastic limit of the motor shaft, no permanent damage will occur. The method that I've been using for many years achieves this, even during full-bore impacts, and works for direct-, belt- and gear-drive setups.

All these mounts use a spinner and a carefully made spacer, so that any load on a propeller blade causes the spinner to "bottom out" on the spacer before the shaft reaches its elastic limit. Normally, the propeller will just rotate out of the way, but occasionally a thin-blade wood prop might break.

A hidden benefit of this mount is the streamlining of the front end. Many electric kits and published designs seem to use the glow-powered practice of letting the motor "hang out in the breeze." One of the potential advantages of electric power is the reduced drag from not having an exposed cylinder head, muffler, carburetor, fuel lines and gaping holes in the cowl. Propeller efficiency can also be noticeably improved by using a spinner and well-shaped front fuselage.

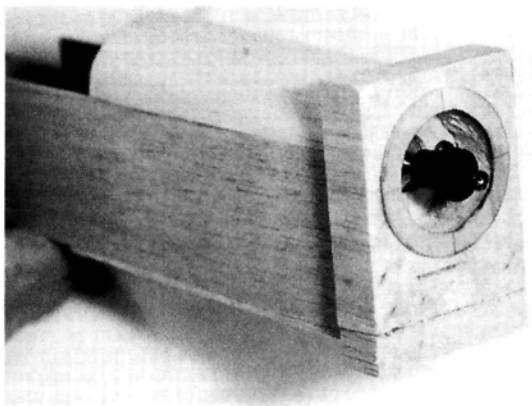
THE DIRECT-DRIVE MOUNT

Most sport planes can be set up with a plywood firewall, to which the motor can be simply bolted, making sure that the screws do not penetrate too far into the motor where they might hit the armature. For larger motors, use of a half-round cradle is advisable to support the rear of the motor. After the motor is in place, install the chosen spinner and propeller, and carefully measure the distance from the front of the firewall to the backplate of the spinner. This distance will be filled with an end-grain balsa block and a 1/16-inch-thick plywood nose ring, leaving at most a 1/32-inch space for clearance. Make sure that the balsa block is cut with its grain parallel to the motor shaft as it will have vastly higher crush strength that way.



On most sport planes, the motor can be mounted directly on the plywood firewall. An end-grain, balsa block spans the distance between the firewall and the back of the spinner. (Installation of direct-drive, Keller 50 shown.)

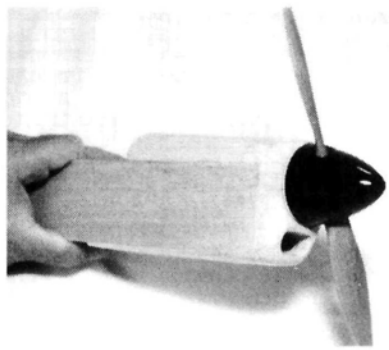
Obviously, a hole needs to be cut in the block to clear the prop shaft and allow access to the mounting screws. For now, the outside of the block is left over-size, but eventually it will be carved to blend the fuselage shape into the spinner. Cut the plywood nose ring to the diameter of the spinner backplate, also cutting an internal hole to clear the prop shaft and screw access. First glue the nose ring to the front of the balsa block, then place the block on the front of the fuselage and mount the spinner and prop. Carefully align the plywood ring with the spinner backplate and glue the block to the firewall. Now the block may be carved to smoothly fair into the spinner.



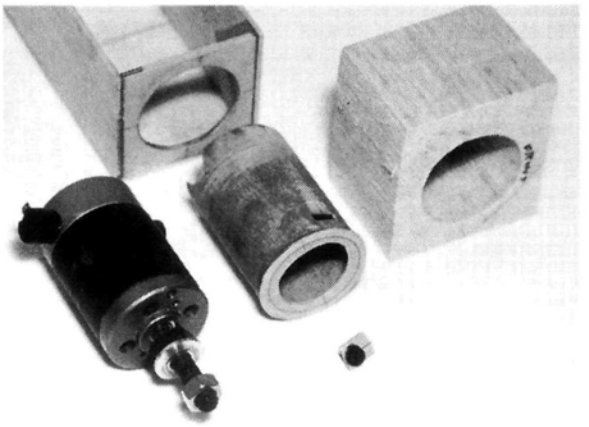
A hole in the balsa block provides clearance for the prop shaft and mounting screws. The plywood nose ring strengthens the area around the hole.

On a plane with a heavily sculptured or very sleek front end, a front firewall mount can be difficult to do. For these I make a rolled tube out of 1/64-inch-thick plywood to sleeve the motor (two to three layers is sufficient). This tube can be formed right on the motor, but be sure to first put a layer of plastic wrap on it to prevent the tube from becoming a permanent part of your motor! You can use epoxy or slow-set CA to laminate the layers of plywood. The tube length should be from the rear of the motor to the spinner backplate. You may have to make cutouts at the rear for motors that have exterior brushes.

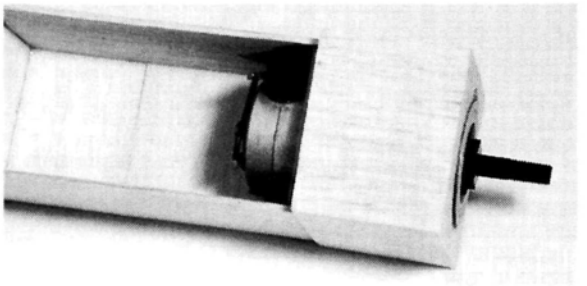
For this mount, the firewall is toward the rear of the motor, so the bulkhead must have a hole of the same diameter as that of the outside of the plywood tube. The nose ring is glued to the front of the tube, while the fairing is again a soft balsa block cut oversize to fill the distance between the rear firewall and the nose ring. To hold the motor in place, one or two plywood tabs can be keyed



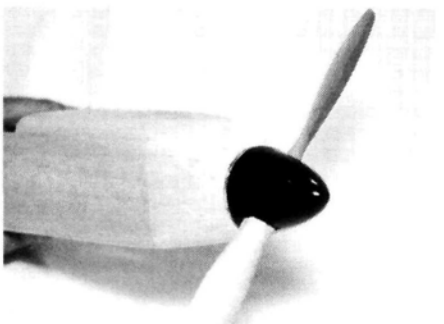
The balsa block is faired into the fuselage and provides a smooth transition from the spinner. The author's mounting system helps prevent the prop shaft from bending.



Rear bulkhead mount (installation of Astro 25 shown). The motor is inserted through the rear of the plywood tube. Note the slot in the tube for the plywood indexing tab and screw.



A balsa block spans the distance between the rear bulkhead and spinner. The motor-mount tube, with nose ring attached, slides through the block.



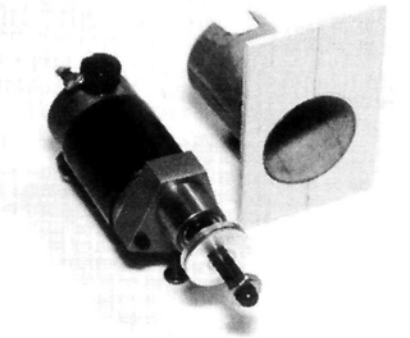
Completed rear-bulkhead mount shows finished carving and sanding of block cowl.

into the plywood tube to allow screws to attach to the front of the motor at the bolt holes. Hopefully, the photos will make all this self-evident.

THE REDUCTION-DRIVE MOUNT

Mounting reduction drives presents several problems involving offset between motor and prop-shaft centerlines, and the loss of the front mounting holes. Although it's tempting, *never* try to trap a bulkhead between the motor and gearbox. Problems with gear mesh and alignment will rapidly age the teeth and could cause destruction of the whole unit. The photos for this mount are specifically suited to Astro Flight motors and gearboxes, but can be adapted for other combinations. A rolled plywood tube is used again, but this time it's made only as long as the body of the motor. The cutouts to clear the brushes are used to prevent motor rotation. If the tube is glued into a hole in a plywood bulkhead as shown, the gearbox traps the motor in place lengthwise. During installation the motor is inserted into the tube from the rear while the gearbox is bolted on from the front. From here on, the method of making an end-grain balsa spacer and plywood nose ring is identical to the direct-drive mount.

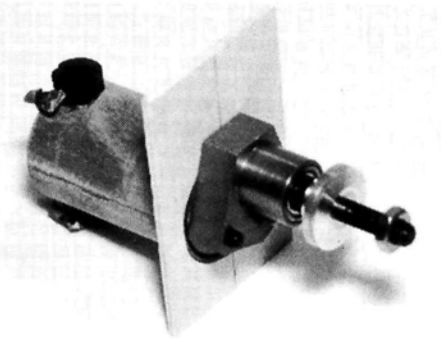
A few words about care of gearboxes are in order. It's very important to set the mesh correctly to achieve good operation. If the mesh is too tight, the motor and gearbox bearings will wear out quickly, and the system will draw more current than necessary. If the mesh is too loose or sloppy, the gear-tooth surface will wear out or the teeth will break off. If the gears are accessible (such as on the Astro units), loosen up the mounting screws and walk a strip of ordinary typing paper between the gears. While pushing on the gearbox so that the gears are forced together, tighten the mounting screws. The correct mesh will now be set after the paper is removed by rotating the prop shaft. Don't forget to lubricate metal-to-metal gear trains with a little bit of white lithium or molybdenum disulfide grease. Gear trains using plastic gears rarely need lubrication, which in some cases may ruin the gears. In any case, follow the manufacturer's recommendation.



Mount for a geared Astro 15. Note the cutouts in the plywood tube that accommodate the motor's brush holders.

CONCLUSION

Using these techniques will protect your motor and, as an added benefit, improve your plane's performance because of decreased aerodynamic drag. If you have any questions, you may write to me, but please include a self-addressed, stamped envelope. Keith Shaw, 2756 Elmwood, Ann Arbor, MI 48104.



The motor is inserted from the rear of the tube, and the gearbox is attached from the front to keep the motor in place. Never try to sandwich the bulkhead between the motor and the gearbox.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

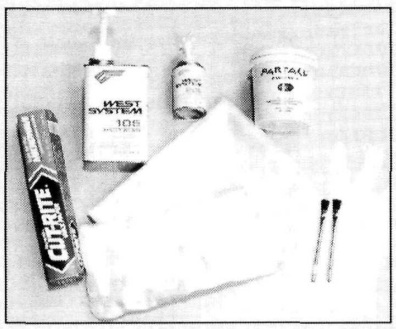
HOW TO

Make Your Own Fiberglass Cowls

9 simple steps to a stronger cowl

by BRIAN BANGE

Materials



These materials work well for me and are the minimum I recommend for a successful job.

- 1 quart West System no. 105 epoxy resin
- Hardener—West System no. 206 (25-minute pot life), or 209 (45-minute pot life). Note: the lower the temperature, the longer the cure time.
- 1 yard 16-ounce satin-weave fiberglass cloth
- 1 yard 6-ounce loose-weave fiberglass cloth
- Disposable plastic gloves
- Paste wax *(no silicone!)*
- Wax paper
- A flexible, flat-bottom container, e.g., an empty butter tub
- Flux brushes (usually 15 to 20 cents at your local hardware store)
- Stirring stick

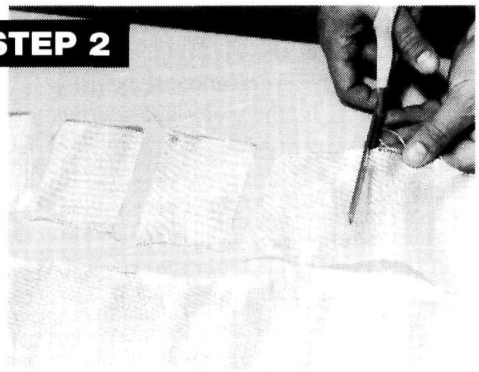
WHEN THE ABS COWL on my airplane cracked, I decided that a fiberglass replacement cowl would be a good alternative. Unfortunately, I found that fiberglass cowls could be a bit costly, and they aren't available for some models. At this point, I realized that I could make my own using a kit-supplied ABS cowl as a mold.

Read on as I describe the process and the materials you'll need, which are mostly inexpensive. The West System* epoxy is not, but I've found that 1 quart will go a long way. I made five molds, six cowls and two wheel pants, and I skinned the front half of my Ultimate, and I still have ⅓ quart left. It's first-class. Overnight, it cures so hard that a part may be removed from the mold in the morning and sanded, and it doesn't plug the sandpaper.

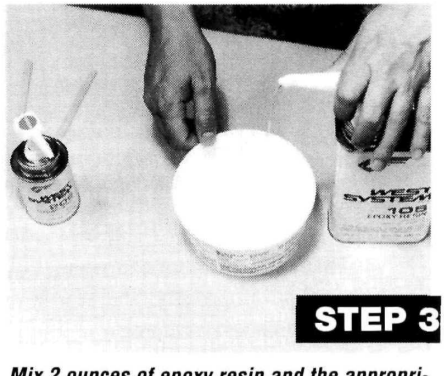
STEP 1

Wax your ABS part with plenty of non-silicone wax; I use Partall* paste no. 2. Make sure that there isn't any silicone in your wax; if silicone gets onto your part, you'll never be able to make paint stick to it.

STEP 2



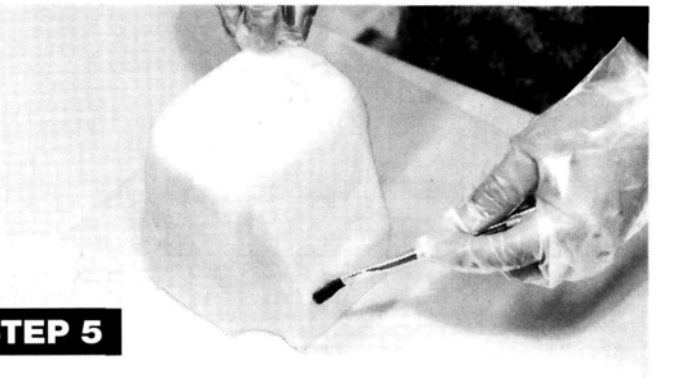
Cut out square pieces of both thicknesses of glass cloth. The size that works best for me measures about 3 inches square. If the cowl has small features such as scoops, cut small pieces of the 3.16-ounce cloth to fit into them. Cut enough cloth to cover the entire ABS cowl once with the 3.16-ounce cloth and twice with the 6-ounce cloth.



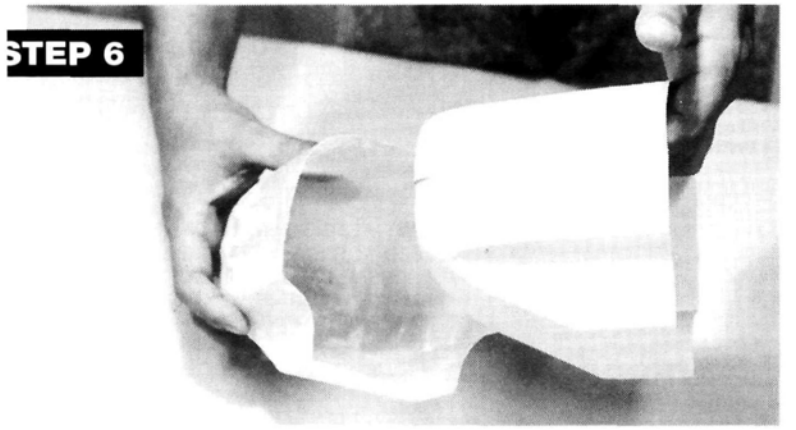
STEP 3

Mix 2 ounces of epoxy resin and the appropriate amount of hardener in a large plastic tub. Try to use a container that has a large flat bottom. The shallower the epoxy, the longer its pot life. West System sells epoxy pumps that meter the right amounts of epoxy and hardener. They last for several cans and really take the guesswork out of mixing.

Put on your disposable plastic gloves and place the ABS cowl nose up on a piece of wax paper. Put the squares of 3.16-ounce cloth onto the outside of the cowl. Paint the resin over the cloth; it will seep through and stick to the ABS. The weave of the cloth is very loose, and it will conform to the contour of the cowl. I haven't had problems with wrinkles.

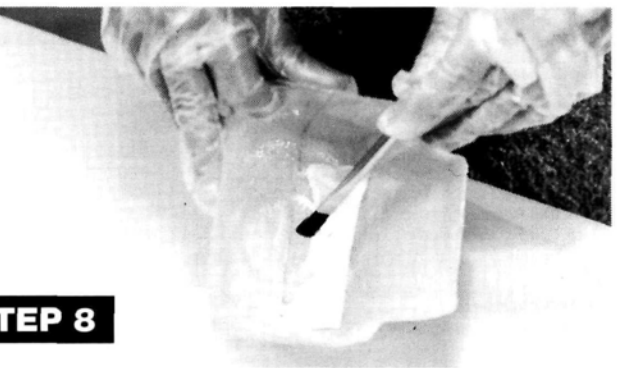


When the cowl is completely covered with 3.16-ounce cloth, immediately switch to the 6-ounce cloth and paint on two more layers. When you've finished, let it cure for 12 hours—longer, if your shop is cold.

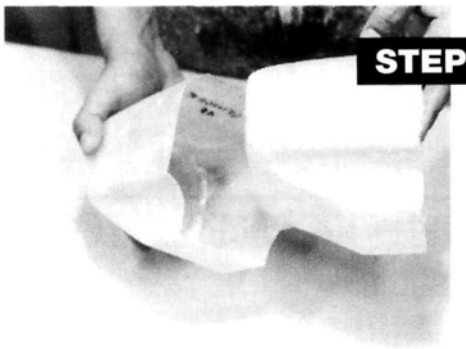


When you return, the epoxy should be rock-hard, yet the entire mold will be slightly flexible. The ragged edge of the cloth is sharp and will cut like a knife, so use a Dremel tool or a sanding disk to remove any sharp edges. After that, flex the mold gently and watch as the fiberglass comes off the ABS (you'll be able to see this through the epoxy). The area that has separated from the fiberglass will look lighter. By gently squeezing and twisting the mold, try to remove the entire ABS part without damaging it. If you used plenty of wax in step 1, it will pay dividends here. You now have a female mold of your cowl. With it, you'll be able to make many copies of the original ABS cowl.

Wax the inside of the fiberglass mold as you did in step 1.



Cut more squares of fiberglass, as you did in step 2. Mix 2 ounces of epoxy, and paint the squares into the mold as you did in steps 4 and 5. In areas that will be subjected to high stress, add more layers of cloth. Try to keep the epoxy layers as thin as possible; the cloth will change color as it's wetted, and using more epoxy than you need to wet it will add only weight, not strength. When you've finished, let the part cure for 12 hours.



Now for the fun. As in step 6, squeeze and twist the mold to separate it from the cowl. After some coaxing, it will pop out, and you'll be rewarded with a perfect copy of your ABS cowl. Cut openings for your engine and exhaust system, then finish-sand it and paint it with a thin coat of primer. If there are any pinholes or bubbles, they'll become visible. Fill them, sand once more, and you'll be ready for your finish color.

Although this process takes two days, the actually work time is usually less than 2 hours for the first part and less than 1 hour for every additional part. (Remember to re-wax the mold between parts.)

Note: if it's to be successfully removed from the mold, the ABS part must have "draw angle," i.e., as the part sits on the bench with the spinner side facing upward, nowhere should there be an angle between the part and the bench that's greater than 90 degrees. An angle of less than 90 degrees is preferable and will make removing the part easy. Most ABS cowls are vacuum-formed over a plug, so they always have a proper draw angle.

If you have flying buddies with similar planes to yours, you might be able to convince them to buy one of your cowls, and that will help to offset the cost of your materials. At my club, Lanier Stingers are popular, and several sport fiberglass cowls are made with my mold.

I find making my own parts in this way very rewarding, and I'm already dreaming up ways to make other parts using this process. I hope you'll try it.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

AERO*COMP
Software for Analyzing Aircraft Performance

New features aid competition fliers as well as beginners.

by GEORGE MYERS

*Editor's note: imagine knowing how well your model will perform before you build it! USR&D's AERO*COMP software helps you to select a motor, a gearbox and a prop that deliver maximum thrust. It also lets you experiment with the airframe design to maximize your rate of climb, air speed, glide ratio, or flight duration. Noted author George Myers presents his thoughts and conclusions about the workings of the latest version of this program. In addition, he also includes useful tips for correctly running this type of software—sure to be of value to most readers, especially those without extensive computer experience. This information is presented in a separate sidebar format. Also, we've included some late-breaking information on the next AERO*COMP release—Version 3.0-E, which should be available in February '95 (see sidebar).*

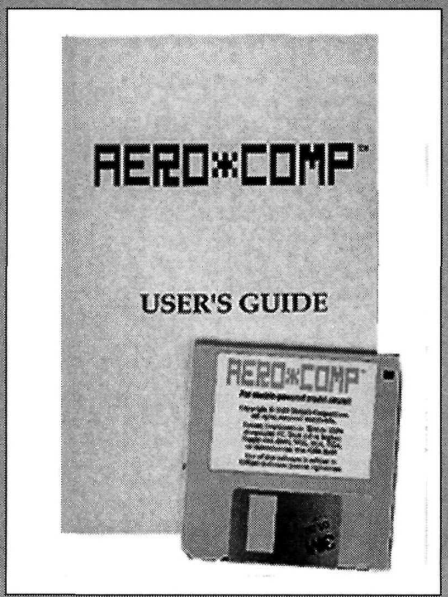
AERO*COMP* is a program to compute airplane performance based on user-entered specifications for an airplane. It will run on an IBM PC (8086), XT-class (8088, 2-floppy) computer or better (286, 386, 486), using MS-DOS 2.0 or higher. AERO*COMP uses 320K of hard disk space (preferred installation) and at least 400K of free RAM. Drop-down menus provide for data entry. On-line help files are available for menu items by using the <F1> function key. One hundred sixteen common electric motors are listed on a menu with their electrical characteristics.

I've been asked to review this piece of software. While I make no claim to being a software maven, I do know how to do a review. First, you open the box and count all the pieces; then you read the section in the users' manual called "Getting Started." It will contain a list of the things that are supposed to be in the box. The list should match what you found.

BOOTING UP

The AERO*COMP users' manual is thin; therefore, you have no excuse to avoid reading it. The reason that the master disk must *not* be write-protected is because the AERO*COMP master disk contains a

Disk Tips



*Here are some general guidelines that should be followed when operating a new computer program, such as AERO*COMP, from a disk:*

• **Write-protecting the disk.** Examine the program disk. It should be flat, clean, and free of visible damage. When you hold the disk so that the label is visible and the cut-off corner is on the right and away from you, there should be an ⅛-inch square window on the lower left (3.5-inch disk) or a 3/16x⅛-inch notch on the lower left side (5.25-inch disk). In the case of the window, there may be a shutter on the back. Slide it so the window is open. In the case of the notch, cover it with a piece of black tape. These actions "write protect" the disk so that you can't accidentally write on it and damage the program.

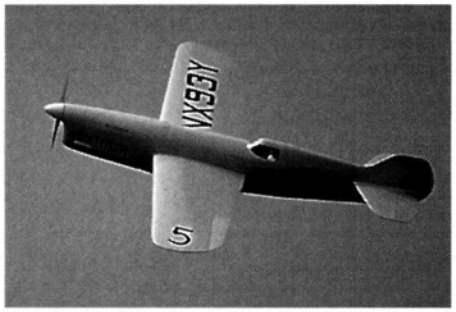
• **De-bugging the disk.** Now, use your anti-virus program to examine the disk. You won't find any viruses in commercial programs—at least, you shouldn't. But the consequences of letting a virus into your computer are so severe that there is no justification for not looking. None!

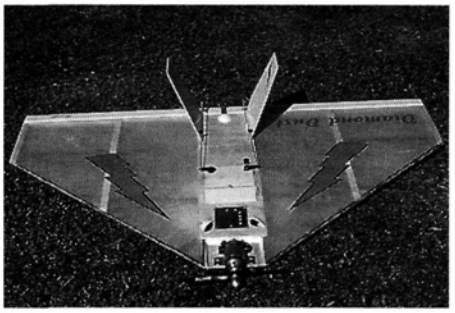
AERO*COMP disks are extensively tested for viruses and other defects before shipping. Most good software is tested that way.

• **Making a backup.** Having found no viruses, DISKCOPY (DOS command) the master disk(s). Label each copy disk for what it is. Now take a directory of that disk (DOS DIR command). Look for a file named READ.ME, README.TXT, README.1ST or something like that. Print that file. You can use the DOS PRINT command, or use TYPE filename.ext and follow it with CTRL+P and ENTER. Remember to CTRL+P again, when the printing has been completed. README usually contains last-minute instructions that aren't in the users' manual. Read them.

In the case of AERO*COMP, it serves no purpose to make a copy of the master disk, and you should remove the write protection from the master disk as soon as the virus check has been done. And you should read the README.DOC file.

Now comes the part everyone wants to skip, but shouldn't. Read the book! Read it two, three, even four times, or as many times as necessary for you to understand what the program is supposed to do. Some books are so thick and heavy that you don't even want to open them. The 1,000-page Word Perfect manual comes to





AERO*COMP will predict the performance of any type of model airplane—even glow-powered (see text). Here are two examples of electric aircraft: one is a scale pylon racer and the other is a flying wing. Performance of both ships can be predicted using the AERO*COMP program. Keith Shaw's Goon (left) has a wingspan of 69 inches. This 14-pound replica of Art Chester's 1939-winning pylon racer uses a 16x12 APC prop directly driven by an Astro 90 on 36 1400mAh SCR cells. The Diamond Dust delta wing (right) by Russ Pribanic is capable of a blistering 101mph (radar verified), and has a fast roll rate and an incredibly slow landing speed. The motor is a direct drive, five-turn Astro FAI 05 with a 7x7 prop, and eight 1400 SR Max cells. Total flying weight is just under 3 pounds.

copy-protection scheme that unloads from the master disk and installs on your hard disk during installation. That prevents the master disk from making installations on additional machines. But save it! If you later want to remove AERO*COMP for any reason, *don't erase it!!* Use the RECALL program provided on the master disk, which will write the authorization back to the master disk to make it usable again. All this and other interesting things (like how to make one master disk serve an entire club) are explained in the manual that you didn't read.

AERO*COMP contains printer drivers for common printers. My HP laserjet (which maintains a continuous dialogue with the computer) must be connected, turned on and *ready*, or AERO*COMP will present a list of reasons why it isn't printing. Then it flips you back to the menu where you make the PRINT selection. It's the correct action, but annoying. In effect, the program is saying, "Look, dummy, you want me to print a report but you haven't given me anything to print with." I hate smug computers, don't you?

mind, as an example. I'm no different from you. My strategy is to read the table of contents. Then, at least I'll know where to look for information when I get lost.

While you are reading, back up all the programs on your hard disk! Some programs are like ants. They go everywhere and get into things you never expect. This is particularly true for WINDOWS programs (which AERO*COMP *isn't*, though it will run under Windows). Never assume that the program you are loading won't act that way. The least damage you can expect is that the new program will rewrite your AUTOEXEC.BAT and CONFIG.SYS files, if it runs from the DOS prompt. It will add things to the (filename).INI files in Windows. They can cause your computer to lock up when it is in the BOOT mode, particularly if the program waits for confirmation of something, like a printer connected and ready. Figuring out what happened can drive you up a wall. I've been up there several times. Thankfully, AERO*COMP doesn't do those nasty things.

Now, you are ready to load and review the new software.

IS AERO*COMP ONLY FOR ELECTRICS?

Once loaded, AERO*COMP signs on with the message, "For electric airplanes." Partially true. The computations apply to any powered airplane—from electric-powered sailplanes to Formula One racers. The predictions *can* be used with internal combustion (IC) engines, but you have to be creative.

Let's say that AERO*COMP predicts that your proposed model will need 850 watts to fly. I know, the definition says 746 watts per horsepower, but that depends on the horse. Assume that 1,000 watts equals 1 horsepower, and you won't go far wrong. So 850 watts means 0.85 horsepower. A used .60, blowing oily sport-fuel smoke through a muffler, should give you that. So will a new ABC .20 snorting 50-percent-nitro though a tuned pipe. This version of AERO*COMP doesn't give you a menu of IC engines and fuels, that's all.

One way to deal with IC is to lie to AERO*COMP. Enter the propeller diameter and pitch recommended for your IC engine, select a big, little or medium electric motor appropriate to your IC engine, and keep changing the number of battery cells and the electric motor characteristics until the rpm are the same as those specified for your IC engine turning that prop. The resulting flight predictions will be correct.

One AERO*COMP calculation is very useful to me. There is a large selection of propeller sizes available from your dealer. But gear ratios for electric motors are distinctly limited. You can use AERO*COMP to find the most suitable of the available gear ratios, or you can enter the gear ratio you have and find the best propeller to match the motor to the airplane. In general, electric airplanes fly longer and higher with large propellers and a gearbox between the motor and the prop. They also fly faster with smaller propellers and direct drive. Very few gearboxes are sold for IC engines, though some belt drives are available on the "after-market."

AIR SPEED AND ITS EFFECTS

AERO*COMP reports two air speeds of interest:

- Air speed limited by air drag (ASdrag).
- Air speed limited by propeller rotation (ASprop).

Air drag increases with the square of velocity and consumes power. ASprop

New! AERO*COMP Version 3.0-E

Dr. Paul Ogushwitz, president of USR&D, informs us of a new version of his company's AERO*COMP program—Version 3.0-E (scheduled for availability in February). The new program has all of the features found on the previous version, and now includes the following updates:

- All of the airfoils from the Selig, Donovan and Fraser measurement series (also called the "Princeton data" and "Soartech 8"). There are 53 airfoils altogether. The Princeton airfoil data was obtained using consistent, standardized techniques and at Reynolds numbers typical of model aircraft.
- There is now data for 223 motors (the previous version had 116). New motors from Astro Flight (including the new five-turn motors), Aveox, Graupner, Hecktoplett, MaxCim, Mega, Robbe (Keller) and others will be included.
- Improved calculations of rate of climb and climb angle.
- The user can now input data for as many as 100 motors.
- USR&D, along with Jim Stibbards, is exploring the possibility of data input from, and output to, the Computer Aircraft Design program (a CAD program). If feasible, this will be included on the new version of AERO*COMP.

Sample AERO*COMP Printout

The following AERO*COMP report shows the style.

Date:	02/02/94
Time:	11:34
Units:	English
Model:	C46MTUP
Motor:	Astro Cobalt 15 FAI—geared

INPUTS		PREDICTIONS	
2.	Number of motors	13026.0	Motor rpm at full throttle
0.055	Motor resistance (ohm)	5462.5	Prop rpm at full throttle
0.000500	Dynamo constant (volt/rpm)	40.5	Motor current at full throttle (amp)
0.419355	Gear ratio	8.7	Motor voltage at full throttle (volt)
10.00	Number of battery cells per motor	77.8	Thrust at full throttle (ounce)
20.00	Number of battery cells in aircraft	3.0	Thrust duration at full throttle (min)
2000.0	Cell capacity (milliamp-hour)	354.5	Motor input power at full throttle (watt, per motor)
1.30	Cell voltage (volt)		
0.009	Cell impedance (ohm)	247.8	Motor output power at full throttle (watt, per motor)
0.015	Wiring resistance (ohm)		
1.	Circuit type (1=series, 2=parallel)	69.9	Motor efficiency (percent)
4.	Number of blades per prop	0.42	Optimum gear ratio for motor/battery/ prop system
10.70	Prop diameter (in.)		
10.00	Prop pitch (in.)	5462.1	Full throttle rpm (prop) at optimum gear ratio
1.	Aircraft type (1=monoplane, 2=biplane, 3=triplane)	9.94	Wing area (sq. ft.)
		8.15	Wing aspect ratio
108.00	Wingspan (in.)	16.1	Wing loading (oz/sq ft)
30.00	Wing midspan (in.)	41.5	Takeoff distance (ft)
17.50	Wing chord at root (in.)	2.5	Takeoff duration (sec)
5.25	Wing chord at tip (in.)	21.3	Takeoff air speed (mph)
2.00	Wing thickness (in.)	4.5	Thrust duration at takeoff air speed (min)
2.	Airfoil (1=Clark Y, 2=semi-symm, 3=symm, 4=undercamber)	51.7	Maximum air speed considering prop rotation (mph)
6.	Fuselage type (1=none, 2=flat, 3=prt-rnd, 4=rnd, 5=prt-strm, 6=strm)	51.9	Maximum air speed considering air drag (mph)
78.00	Fuselage area (sq in)	532000.	Reynolds number of wing at max air speed
2.	Landing gear (1=none, 2=gear up, 3=gear down)	466.2	Maximum rate of climb (ft/min)
		1379.9	Maximum altitude at full throttle (ft)
2.	Runway type (1=paved, 2=1-in. grass, 3=2-in. grass, 4=water, 5=hand)	9.3	Maximum climb angle (degree)
		9.6	Maximum lift-to-total-drag ratio
100.	Runway elevation (feet above sea level)	7.2	Maximum glide duration (min)
160.00	Aircraft weight (ounces)	10.2	Maximum total duration (min)
		==========>	aircraft is expected to fly

computes the air speed that can be obtained with the power available from your electric motor.

ASprop assumes that the propeller you are using works like a screw. "Power available" will turn the propeller you entered, using the suggested "optimum gear ratio," at some rpm in idealized incompressible air. That might screw it through the air at the speed given, but real air is compressible, so the prop can't really go that fast.

In general, the ASprop must be greater than takeoff air speed, in order to fly the airplane with enough energy to do a little maneuvering. On the other hand, AERO*COMP may show a larger value for ASprop than for ASdrag. In actual flight conditions, your actual in-flight maximum air speed will be the smaller of the two values.

In the case of a powered sailplane, or an "old timer," you want an ASprop that's 10 to 15 percent higher than takeoff air speed, in order to minimize the power lost to air drag. You run the program, keeping an eye on the gear ratio (which should match what you really have), the rate of climb and the altitude. If the competition rules specify a maximum motor run time, then you want to select a propeller that maximizes rate of climb and maximum altitude and exhausts the batteries in the specified time (so as to carry minimum battery weight). Ultimately, you want to get as high as possible with the power available. You don't care about air speed, as long as the airplane can be controlled.

HOW ACCURATE ARE PREDICTIONS?

Enough of this. What happens when you use AERO*COMP the way it is intended to be used? As a check, I flew two of my electric-powered sailplanes, one of them a high-performance F3E (now F5B) model. Each carried my Casio altitude watch. We made several timed climbs and recorded the results. Then I made some timed, level flight passes at minimum speed and under full power. The results were compared with AERO*COMP predictions. The predictions (initial rate of climb, maximum altitude, stall speed and full-throttle air speed) matched the test data within 10 percent. You have to realize that all instrumentation has errors, the batteries may not have ideal properties, and the propeller pitch may not be what is printed on the blades, etc. All this considered, I conclude that AERO*COMP produces good predictions.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

SPORTY SCALE

(Continued from page 113)

favorite blend. Moki's are available from most hobby retailers through Gerard Enterprises*. Best of all, Jim Gerard has thoughtfully teamed up with Bisson Custom Mufflers* so that you may get almost any exhaust system you could possibly want for your Moki and several other brands of engines, whether it's the conventional, Pitts or canister type.

Anyhow, getting back to the performance thing, the Moki likes 5 or 10 percent nitro content in the fuel and turns its favorite prop—an 18x8 Zinger* at 8,500rpm—once it has been broken in. That's about 500 to 700rpm greater than the next closest engine. I'm using it in my pace plane and changing props all the time, depending on whether I feel like sport flying or if I'm practicing for a race. Props, schmops, it flies great on them all.

Until next time, enjoy your building season. We've had a rekindled interest in listing some scale kits and documentation sources, probably by those just starting to read the column, so we'll try to address those topics once again in the next few months. Until then, be happy, your six is clear.

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■

INDEX OF MANUFACTURERS

A-Cubed; *manufactured by Induction Systems Inc., P.O. Box 489, Chouteau, OK 74337.*

Abell Hobby & Mfg., *P.O. Box 22573, Billings, MT 59104; (406) 259-4882.*

Ace R/C, *116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (816) 584-7121; fax (816) 584-7761.*

AERO*COMP, *USR&D Corp., P.O. Box 753, Hackettstown, NJ 07840-0753; (908) 850-4131.*

Aerosil; *distributed by Aerospace Composites Products, 14210 Doolittle Dr., San Leandro, CA 94577.*

Aerrow Inc., *P.O. Box 183, 1881 Rogers Rd., Perth, Ontario, Canada K7H 3E3; (613) 264-0010; fax (613) 264-8441.*

Air Flair, *1750 Lundgren Rd. New Carlisle, OH 45344; (513) 849-0411; fax (513) 849-0418.*

Airtronics, *11 Autry, Irvine, CA 92718; (704) 830-8769.*

Altech; *distributed by MRC, 200 Carter Dr., Edison, NJ 08817; (201) 584-7030; fax (201) 252-1124.*

APC Props; *distributed by Landing Products, P.O. Box 938, Knights Landing, CA 95645; (916) 735-6475.*

Astro Flight Inc., *13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.*

Atlas; *manufactured by Ace R/C Inc. (see address above).*

Barton Machine, *11640 Salinez, Garden Grove, CA 92643; (714) 539-9142.*

Bulldog Bearcat; *distributed by Frank Tiano Enterprises, 15300 Estancia Ln., FL 33414; (407) 795-6600.*

Bisson Custom Mufflers, *RR 1 Taits Island, Parry Sound, Ontario, Canada P2A 2W7; (705) 389-1156; (705) 389-1156.*

Bob Banka's Scale Model Research, *3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058.*

Bob Smith Industries, *8060 Morro Rd., Atascadero, CA 93422; (805) 466-1717; fax (805) 466-3683.*

Byron Originals, *P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-2028.*

C.H. Electronics, *P.O. Box 1732, Riverton, WY 82501; (307) 857-6897.*

CGM (Carl Goldberg Models), *4734 West Chicago Ave., Chicago, IL 60651; (312) 626-9550.*

CB Associates; *distributed by CB/Tatone Inc., 21658 Cloud Way, Hayward, CA 94545; (501) 783-4868.*

Century Jet Models, *11216 Bluegrass Pkwy., Louisville, KY 40299; (502) 266-9234; fax (502) 266-9244.*

Coverite, *420 Babylon Rd., Horsham, PA 19044; (215) 672-6720.*

D&W Aircraft, *409 Mid Pines Way, Modesto, CA 95354.*

Double M Electronics, *2309 Hanover Pl., Bowie, MD 20716-1106; (301) 805-9361.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084; (800) 848-9411; (800) 848-9411; (708) 526-1604.*

Dynathrust Props, *Box 91, Georgetown, TN 37336; (615) 476-2330.*

Endless Horizons, *P.O. Box X, Torrance, CA 90507; (310) 320-8369; fax (310) 320-8354.*

Enya; *distributed by Altech Marketing (see address above).*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718; (714) 455-9888.*

Gerard Enterprises, *W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; (414) 521-0551.*

Great Planes Model Distributors, *2904 Research Rd., Champaign, IL 61826-9021; (217) 398-3630; fax (217) 356-6608.*

Herbrandson Engines Inc., *4909 W. Marine Ave., Lawndale, CA 90260; (310) 679-3402; fax (310) 679-1225.*

Hi-G Promotions Inc., *P.O. Box 219181, Houston, TX 77218-9181; (800) 741-7058.*

Hitec/RCD Inc., *10729 Wheatlands Ave., Ste. C, Santee, CA 92071-2854; (619) 258-4949; fax (619) 449-1002.*

Hobby Poxy, *36 Pine St., Rockaway, NJ 07866; (201) 625-3100; fax (201) 625-8303.*

ISC Intl., *P.O. 40116, Indianapolis, IN 46240.*

J'Tec, *164 School St., Daly City, CA 94014; (415) 756-3400.*

Joe Pasquito, *168 Gainsboro Rd., Lawrenceville, NJ 08648.*

JR; *distributed by Horizon Hobby Distributors, 3102 Clark Rd., Champaign, IL 61821; (217) 352-1913; fax (217) 352-0355.*

Kennedy Composites, *1304 Cullins Ave., Austin, TX 78757; (512) 206-4078.*

Master Airscrew; *distributed by Windsor Prop Co.,3219 Monier Cir., Rancho Cordova, CA 95742.*

Miller R/C Products, *P.O. Box 425, Kenwood, CA 95452; (707) 833-5905.*

Moki; *ditributed by Gerard Enterprises Inc., (see address above).*

Nelson Aircraft Co., *21550 NW Nicholas Ct., Unit D, Hillsboro, OR 97124; (503) 629-5277; fax (503) 629-5817.*

O.S.; *distributed by Great Planes (see address above).*

OPS; *distributed by Shamrock Competition Imports, P.O. Box 26247, New Orleans, LA 70186.*

Pacer Technology, *9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.*

Partall Paste/Rexco, *P.O. Box 1045, Carpinteria, CA 93013;(805) 963-6505.*

Performance Specialties, *P.O. Box 3146, Gardnerville, NV 89410, (702) 265-7523; fax (702) 265-7522.*

Platt Models, *1306 Havre N.W., Palm Bay, FL 32907; (407) 724-2144.*

PowerMaster, *94-A Red River, Austin, TX 78701.*

RacePro Engineering, *12880 Quartz Mt. Rd. E., P.O. Box 445, Sulter Creek, CA 95685.*

Robart Mfg., *P.O. Box 1247, 625 N. 12th St., St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.*

Scale Model Research, *3114 Yukon Ave., Costa Mesa, CA 92626.*

Sig Mfg. Co., *401 S. Front St., Montezuma, IA 50171; (800) 247-5008; fax (515) 623-3922.*

Sonic Tronics, *7865 Mill Rd., Elkins Park, PA, (215) 635-6520; fax (215) 635-4951.*

Sullivan Products, *1 North Haven St., Baltimore, MD 21224; (410) 732-3500; fax (410) 327-7443.*

SuperTigre; *distributed by Great Planes Model Distributors. (See address above).*

Thunder Tiger, *2430 Lacy Lane #120, Carrollton, TX 75006; (214) 243-8238.*

Tony Criscimagna, *2 Whites Ln., Woodstock, NY 12498; (914) 679-8549.*

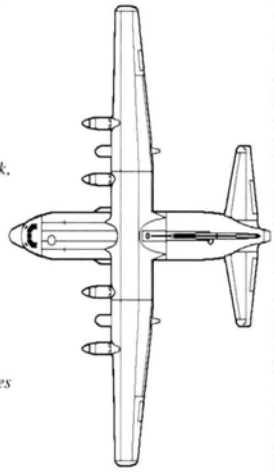
Webra; *distributed by Horizon Hobby Distributors, 3102 Clark Rd., Champaign, IL 61821; (217) 352-1913; fax (217) 352- 0355.*

Wendell Hostetler, *1041 Heatherwood Ln., Orrville, OH 44667;*

West System; *distributed by Composite Structures Technology, P.O. Box 642, Dept. CH, Tehachapi, CA 93581; (800) 338-1278.*

YS; *distributed by Futaba Corp. of America (see address above).*

Zinger; *distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.*



CLUB OF THE MONTH

W.B.L.C. DE GRONDPILOTEN
Gripvelden 80, NL 4707 ZG, Roosendaal, Holland

This month's club—the West Brabantse Luchtvaart Club de Grondpiloten—hails from Holland. The 120 club members fly gliders, electric-powered planes, trainers, scale models, ducted fans, helicopters and other "self-made strange creatures." Their flying field is close to the Belgian border, so the pilots joke that they have to watch how far away they fly their models because they don't want to cause any diplomatic troubles. Club members also fly at Woensdrecht Air Force Base and are even allowed to use the main runway, which is 12,000 feet long. At a recent "Welcome to Woensdrecht" anniversary celebration, the modelers provided a flying demonstration and a model exhibition.

Every Friday evening, club members meet at a cafe where they exchange ideas and read *Model Airplane News* and other modeling magazines. Their newsletter provided an account of the club's latest fun fly, which included two unusual events. For "water flying," each pilot put a cup of water on his forehead and flew in circles for 1 minute, and in the "flight of the beans," each modeler placed a cup containing 10 beans on his plane, took off, flew in a loop and returned for a landing, where the beans that were left were counted.

Congratulations, W.B.L.C. de Grondpiloten members, and thank you for telling us about modeling in your corner of the world. Your two complimentary subscriptions to *Model Airplane News* are on their way. ■

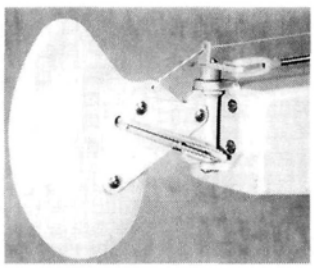
PRODUCT NEWS

MIDWEST PRODUCTS
Midwest Extra 300S

This 27-percent-scale plane was specifically designed to be an unlimited aerobatic performer. The IMAA-legal, giant-scale model features light wing loading and CAD-perfected advanced aerodynamics, which provide a wide speed envelope—from knife-edge snaps, torque rolls and wild tumbles to slow-speed, feather-light landings. The all-wood kit has easy, rugged and lightweight construction throughout, and a full hardware package, computer-drawn plans and an illustrated construction manual are included. Specifications: wingspan—80 inches; wing area—1,162 square inches; flying weight—14 to 17 pounds; engine—1.5 to 2.2 2-stroke or 1.8 to 3.0 4-stroke; radio required—4-channel.

Part no.—180. **Price**—$359.95.

Midwest Products, P.O. Box 564, Hobart, IN 46342-0564; (219) 942-1134.



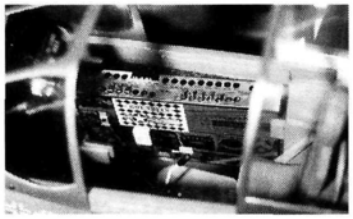
ERNST MFG. INC.
Retractable Water Rudders

Made of high-quality glass-filled nylon, this new line of retractable water rudders is servo-actuated, so the rudders will completely retract with the flip of a radio switch. The rudders also have an automatic kick-up action for beaching or running over objects, stainless-steel screws that don't rust and pull/pull or push/pull steering.

Part nos.—155 (.40 to .60 models); 156 (.90 to ¼-scale models).

Prices—$6.98; $7.98.

Ernst Mfg. Inc., 37570 Ruben Ln., Ste. B, Sandy, OR 97055; (503) 668-5597; fax (503) 668-5931.



OMNIONICS INC.
Roundels® R/C War Gaming Systems

These special effects, which can be used for air-to-air or air-to-ground R/C combat, have five sound variables for machine guns as well as infrared sensors that can be set for up to 200 feet. The system can also be set up for bomb drops, bailouts, smokers, etc., and other sounds, including bomb whistles, hits, explosions, sirens and jets. The 2½-pound system is designed for use in .60 and larger aircraft. A video tape and a technical manual are available, and there's a limited two-year warranty.

Price—$650 (introductory).

Omnionics Inc., P.O. Box 684, 4 N. Main St., Peru, NY 12972; (800) 533-9222.

SIG MFG. CO. INC.
Kadet LT-40

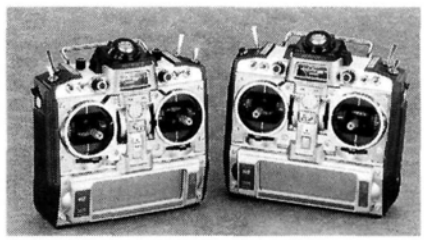
This model's gentle flying characteristics and easy construction make it a great value and a terrific trainer. Every major wooden part in the kit has been shaped, sawn, die-cut, laser-cut and routed. Computer-generated plans and a photo-illustrated manual will take you through every building step and preflight. A complete hardware package, including control horns, pushrods, wheel collars, a glass-filled engine mount, Sig easy hinges, a fuel tank, spinner, wheels and decals, comes with the kit. Specifications: wingspan—70 inches; wing area—900 square inches; weight—5.5 to 6 pounds; wing loading—14 to 15.5 ounces per square foot; engine required—.30 to .40ci 2-stroke or .40 to .50ci 4-stroke; radio—4-channel.

Sig Mfg. Co. Inc., 401 S. Front St., Montezuma, IA 50171; (800) 247-5008, (515) 623-3922.

DU-BRO PRODUCTS INC.
1995 Catalogue

For a free copy of Du-Bro Products' new 1995 catalogue, stop by a local hobby store, or call the 800 number below. This 48-page catalogue describes more than 600 hardware and accessory items, including new products that have just been released. Keep it handy while you build your next model; it may contain some solutions to your various hardware and accessory problems.

Du-Bro Products Inc., 480 Bonner Rd., P.O. Box 815, Wauconda, IL 60084; (800) 848-9411.

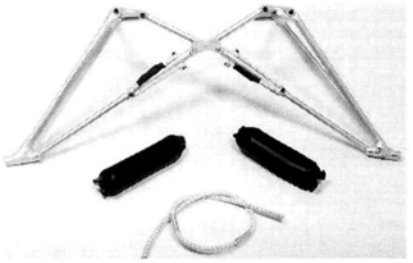


JR REMOTE CONTROL
JR PCM-10SX

With multi-point curve options on three of its programmable mixes, 0-percent to 100-percent trim rates, servo-speed programmability and single-switch, 3-axis rate selectivity, the airplane version of the 10SX is the newest radio of choice for discriminating airplane pilots. Heli pilots will also find the heli version, with its four flight modes that feature independently adjustable stunt trim, revo mix and gyro sensitivity, hard to beat. Four of the heli version's programmable mixes are multi-point programmable for linear or curved response.

JR Remote Control; distributed by Horizon Hobby Distributors Inc., 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

PRODUCT NEWS

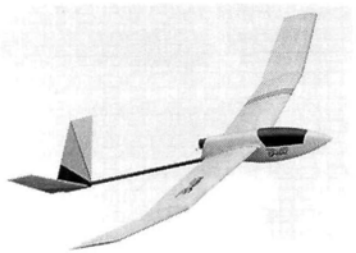


SWENSON SPECIALTIES
Giant-Scale J-3 Landing Gear

These articulated landing gear are designed to be used with ¼-scale Piper J-3 Cubs and similar models. These light (less than 8 ounces), strong gear have working bungee struts and are made of heli-arc-welded 6061 T-6 aluminum. The gear are available in standard (Sig J-3, 6⅛- to 6¾-inch fuselage width) and large (Balsa USA, 7- to 7¾-inch fuselage width) sizes, and they come with custom bungee covers. Replacement parts are available.

Price—$150 (plus $4.50 S&H).

Swenson Specialties, P.O. Box 663, Pinole, CA 94564; (510) 758-0179.



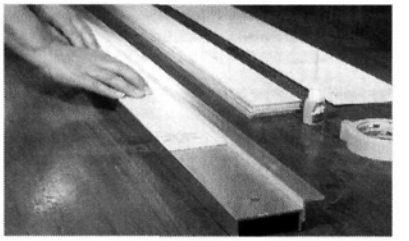
ESTES INDUSTRIES
Sweet Vee

Great for slope or duration soaring, this rocket glider has Obechi-covered foam wings, a molded-plastic mechanical mixer, a blow-molded fuselage and a fiberglass boom. Specifications: length—34 inches; wingspan—55 inches; wing area—340 square inches; weight—16 to 20 ounces. You'll have to provide the R/C equipment, including two mini-servos or microservos.

Part no.—EST 2116

Price—$99.99

Estes Industries, 1295 H St., Penrose, CO 81240.



PRECISION MODEL PRODUCTS
Balsa Edge Sander

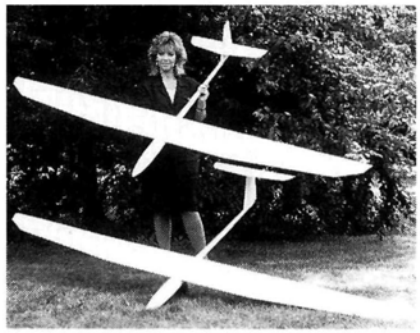
Featuring all-aluminum construction, this tool makes preparing balsa sheets for butt-glued wings a snap. Each edge of the sheet is planed against an adjustable fence with adhesive-backed 3M Tri-M-ite sandpaper (also available from Precision Model Products). Each unit comes with instructions and provisions for mounting it to your work surface. The 52-inch-long sander will straighten sheets of up to 48 inches.

Precision Model Products, 14423 Hix, Livonia, MI 48154; (313) 464-8594.

VAILLY AVIATION
Hawker Hurricane

This updated version of the famous Battle of Britain aircraft is available as an all-wood kit with factory-cut ribs and formers (long stock, such as stringers and sheeting not included), or you can build the model using three sheets of plans (which include full-size formers and the complete wing structure). Vailly Aviation also offers formed accessory parts, such as a fiberglass cowl and belly scoop, a clear plastic canopy, a spinner, retracts, wheels and pilots. Specifica-tions: wingspan—92 inches; length—74 inches; wing area—1,450 square inches; weight—20 to 25 pounds; engine required—2.4 to 3.2ci. Send $1 for a complete catalogue.

Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738; (516) 732-4715.



HOBBY & TOOL OF AMERICA
Spirit Composite F3B/F3E Glider

This light, yet extremely durable, 110-inch-span sailplane has a white, gel-coated, "seamless" glass/carbon/Kevlar epoxy fuselage; a three-piece composite wing with an RG 15 airfoil and Shumman planform; and servo wells for four wing servos for electronic mixing. R/C hardware is included.

Part nos.—1000 (mid-tail configuration); 1001 (T-tail).

Special introductory price—$549.95 (regularly $649.95).

Hobby & Tool of America, P.O. Box 548, Rocky Hill, NJ 08553-0548; phone/fax: (908) 281-5544.

CROWN MODELS
Hawk Pro

Featuring a working front intake and a fixed canard, the Hawk Pro has a durable epoxy fuselage with carbon-fiber and Kevlar reinforcement. The elevons on the sheeted wings have already been cut out. The model flies well powered by any plain-bearing ABC .28 to .46 engine.

Price—$149.95

Crown Models, 316 Locust St., P.O. Box 707, Delavan, IL 61734.

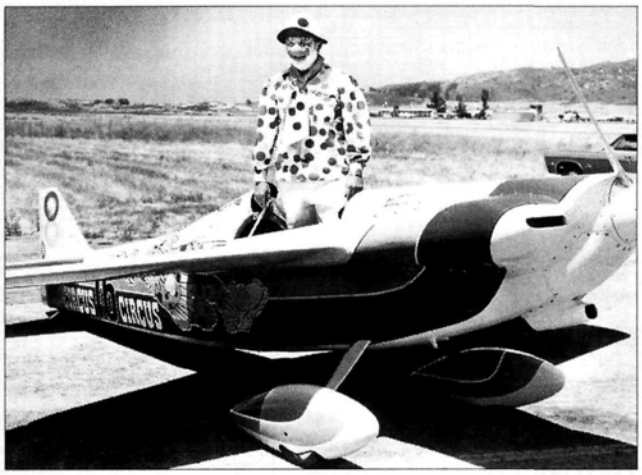
Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**. **Manufacturers!** To have your products featured here, address the press releases to **Model Airplane News,** attention: Product News, 251 Danbury Rd., Wilton, CT 06897.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

CONGRATULATIONS to Ted Winston of Burbank, CA, for correctly identifying the December '94 mystery plane. The aircraft shown is the prototype Percival Prentice—a three-seat primary trainer. It was designed with dual controls for the side-by-side front seats, and a third seat was installed so that the student/observer could gain experience and learn from other students' mistakes. An intercom was also installed so the student/observer could hear the instructor's commentary. The Prentice was equipped with either a 251hp D.H. Gipsy Queen 32 or a 296hp Gipsy 51 supercharged engine. (The Gipsy 51 had a top speed of 171mph.) The wingspan was 46 feet, the length was 31 feet, 3 inches, and it weighed 3,790 pounds loaded. The maximum range was approximately 517 miles. The design was eventually modified and included changes to the rudder, the elevator and the wingtip configuration. ■



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLASSIFIEDS

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: JILL MOLINARO, CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035, or call (203) 834-2326.**

R/C WORLD ORLANDO, FL, CONDO RENTAL: 2 bedroom, furnished. Available weekly or monthly. Low rates. 100-acre flying field with enclosed hangars. Close to Disney World and Epcot Center. For information, please call or write to R/C World, 1302 Stearman Ct., Orlando, FL 32825; (407) 380-6359.

WANTED: built or partially built Ercoupes, Cessna 150, 152, 172, 182, Grumman American Tiger (AA5), American Yankee (AA1), or Mooney M-10 Cadet. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585 [5/95]

MAKE REAL DECALS with your computer and printer! Send $10 for starter kit and instructions to LABCO, 27563 Dover, Warren, MI 48093-4764 [5/95]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537 [5/95]

MODEL MOTORS WANTED—Most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [3/95]

GERMAN AIRCRAFT WW II—handbooks, service part lists, instruction manuals. List—$2. Udo E Hafner, Eugen-Bolz-Str. 15, D-71636 Ludwigsburg, Germany. [5/95]

FLY DAVE BROWN SIMULATOR. Use your transmitter. Works with Futaba, JR, Airtronics, Hitec. Uses Standard joystick connection. For more info, contact Computer Designs, 8530 N. Montana Ave., Helena, MT 59601;(406) 458-9416. [7/95]

ULTRALIGHT AIRCRAFT. New publication has plenty of information, pictures and stories on this exciting flying sport. Buy, sell, trade and kit-built aircraft. You can learn to fly the real thing. Fixed wing, powered parachutes, rotor, balloons and blimps. Sample issue $3. Annual subscription $36. Introductory offer of only $24. "Ultraflight Magazine," 12545 70th St. N., Largo, Fl 34643-3025. [3/95]

ANTIQUE IGNITION-GLOW PARTS CATALOGUE, ½-inch thick, timers, needle valves, cylinder heads, pistons, points, tanks, spark plugs, racecar parts. Engines: ½As, Baby Cyclones, McCoys, Phantoms, etc. $8 postpaid (U.S.); $20 foreign, Chris Rossbach, R.D. 1, Queensboro Manor, Box 390, Gloversville, N.Y. 12078. [8/95]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/95]

CARS. Selling model collection, 1973 issues up, 1/24-1/25, individual prices, about 800. Ralph, Box 2423-P, Yakima, WA; (509) 965-0670. [5/95]

DO YOU SPEAK MODEL AIRPLANE? Seventy years of aeromodeling history! All the heroes, contests, models! Paperback, 320 pages, $19.95 postpaid. Also: Old Buzzard's Soaring Book, $16.95. Dave Thornburg, 5 Monticello, Albuquerque, NM 87123; (505) 299-8749 for Visa/MC [6/95]

SWOOSHIE BAILS OUT! Release a scale-like parachutist! A real crowd-pleaser and a lot of fun! For a brochure, send SASE to Hobby Hut Mfg., 2020 W. 21st N. Ste. #77, Wichita, KS 67203-2107, Dept. MAN. [4/95]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/95]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/95]

R/C SAILPLANES—scale, sport, electric. SAM and NFFS powered, towline, Wakefield. F/F scale and sport powered, rubber, towline. Formerly B2 Streamlines Plans Service. Catalogue $2—all models illustrated. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC, Canada V9B 4Z2. [3/95]

WANTED: OLD, ready-to-run, gas-powered cars, airplanes and boats. Complete or parts. Please write: Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [3/95]

MOLD-MAKING/CASTING GUIDEBOOKS—complete techniques and sources of rubbers, plastics, resins, metals and more. For information, contact Castech-MA, Box 16586, Memphis, TN 38186-0586. [3/95]

DRAWINGS ACCURATELY enlarged and copied. Any scale; any size; three-views; magazine plans; old-timers; antiques. Money-back guarantee. Send $2 for info. Roland Friestad, 221 MAN 155th St., Cameron, IL 61423. [5/95]

WANTED: early O.S. FT-120 Gemini crankshaft, part no. 46002005. Earl Colley, 202 Fair Park Ave., Henderson, TX; (903) 657-3605. [3/95]

DEBOLT PLANES–radio control, free-flight, control-line. Send seperate SASE for each list to Fran Ptaszkiewicz 23 Marlee Dr., Tonawanda, NY 14150-4321. [3/95]

PLANS TO BUILD more than 700 tools, machines and accessories for your shop. Catalogue–$1. Wood-Met. Dept. MAN, 3314 W. Shoff Cir. Peoria, IL 61604-5964. [3/95]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [5/95]

MODEL BOATS: buy, sell, trade, search, restore, or custom-build. Bob Langert, 2350 250th St., Space #30, Lomita, CA 90717; (310) 326-9106. [5/95]

HISTORIC REPLICAS: Flying Tigers, 94th Aero, Lafayette Escadrille accessories; pilot sport shirts, T-shirts, wings, medals, beer steins, scarves; WW I squadron pins–from $4.95. Free gift with order. Catalogue–$1 (refundable). Company of Eagles, 875A Island Dr., Ste. 322N, Alameda, CA 94502. [3/95]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.[12/95]

PAYING $75 each for following toy, metal, outboard boat motors: 35hp Oliver, 50-100hp Mercurys, 40, 75hp Johnsons, Evinrudes, 35, 60hp Gales, also want Super Tiger, Sea-Fury Twins, 10% extra boxed. Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [3/95]

JET ENGINES-pulsejets, Jet-X, Turbonique. Monthly newsletter $17/yr; $25 international; single issue $2. Catalogue $5. DOYLE-JET, P.O. Box 60311-A, Houston, TX 77205; (713) 443-3409.[3/95]

ELECTRONICS ARE NOW: Specalizing in the complete line of Astro Flight equipment and model kits. Plus all of the Leisure motors and model kits in stock. Illustrated catalogue with special electric flight information packet available. Phone: (508) 947-2805, $6 USA, $7.50 foreign. Visa & Mastercard. CS Flight Systems, 31 Perry St., Middleboro, MA 02346 [3/95]

HELICOPTER SCHOOL—five days of hands-on instruction with X-Cell helicopters and Futaba computer radios. Small classes tailored to your individual needs. Beginner to expert. Includes all meals and lodging. Over 350 satisfied students and 13,000 flights logged. Located on a 67-acre airport used exclusively for R/C training. Owned and operated by Ernie Huber, five-time National Helicopter Champion and helicopter designer. Send for *free* informtion and class schedule *now!* R/C Flight Training Center, P.O. Box 727, Cresent City, FL 32112-0727, or call (800) 452-1677. Outside USA: (904) 698-4275, or fax (904) 698-4724. [3/95]

R/C SKYDIVNG-It's fun. It's different. It's a gravity-powered adventure! New, lower prices, new parachutes, *free* jump plane plans, etc., etc. Latest catalogue $1.00. R/C Skydivers, Box 662B, St. Croix Falls, WI 54024. [3/95]

WW I PLANS—peanut to 100 inches. Send 3, $1.00 bills for illustrated catalogue to Clarke Smiley, 23 Riverbend Rd, Newmarket, NH 03857. [3/95]

INTERNATIONAL AIRCRAFT RESEARCH. Need documentation? Include name of aircraft (for availability of documentation) and $3 for three-view and photo catalogue. 1447 Helm Ct., Mississauga, Ontario, Canada L5J 3G3. [4/95]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/95]

TRI-VILLAGE R/CER'S—1995 Swapmeet, Wheaton, IL. Saturday, Feb. 4, 1995, at the *Du Page County Fairgrounds.* Vendor setup—9 a.m.; general admission—10 a.m. 130 tables, *free* parking, hot food, *free* auction, wide aisles, raffle, door prizes and more! Tables $12.00. Admission—$4 per person. Advance registration recommended. To reserve tables or obtain a free flier, call: Jim—(708) 439-6922, or John—(708) 837-1343 after 6 p.m. [3/95]

REPLICA SWISS WATCHES—18KT goldplated! Lowest prices! Two-year warranty! Waterproof! SubmDivers, DaytChronos, others! Phone (404) 682-0609; Fax (404) 682-1710. [3/95]

SCALE AIRCRAFT DOCUMENTATION and Resource Guide. Larger, updated 1995 edition. World's largest commercial collection. Over 5,500 different color FOTO-PAAKS and 30,000 three-view line drawings. 168-page resource guide/catalogue $8.00; Canada—$9.00; foreign—$14.00. Bob Banka's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [3/95]

FOUR BIG SCALE CATALOGUES: SPPS 160 Superscale Plans; SPPS 130,000 Documentation Photos, three-views; Argus Scale Plans Handbook; Argus three-view Scale Drawings. The best! $5.00 each USA, Canada. Add $5.00 each Air Overseas. SASE for plans list, enlarging prices. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403. Phone/fax (910) 292-5239. Visa/Mastercard. [6/95]

DUCTED-FAN BD-10 kit; 1/5.5 scale; accepts Violett fan only. Send SASE for information. Paul Appelbaum, 2232 Riverwood Trails, Florissant, MO 63031; (314) 839-0486. [3/95]

SUPERTIGRE ENGINE .60—N.I.B.—*never* used: $200 OBO. Joe Orosz, 6747 Edgeworth Dr., Orlando, FL 32819; (407) 352-3636. [3/95]

GEE BEE Plans (Benjamin used); 1/3, 1/4, smaller; "Z," R-1, R-2, "Bulldog," "Goon," "Firecracker," monocoupes, Culver, Rearwin, airplane shirts, caps, coasters, wall decor! Big catalogue/news, $4 (refundable). Clements, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608. [4/95]

KITES: **FREE COLOR KITE-O-LOG**: (800) 724-7267, ext. K-MAN. Over 200 kites—from easy-to-fly to high-performance 60mph stunt kites! Go airborne! Get your 80-page, full-color Kite-O-Log, today! [5/95]

PLANS ENLARGED—scanning/plotting services, computer software, free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464. [3/95]

VIDEOS: Top Gun '94, R/C Know How beginners' guide, North Carolina Big Bird Fun Flys; each, two hours long. Send $19.95 plus $3 S&H to E&H Video, 134 Wildwood Dr., New Bern, NC 28562. NC residents add $1.20 tax; (919) 637-3416. [4/95]

GRAND OPENING of NSG Hobbies! We stock hundreds of radio control airplane kits and accessories at everyday low prices. Send $1 for a catalogue: P.O. Box 436, Pomona, NY 10970; (914) 362-4375. [3/95]

WANTED: Pilot kit. Bellanca Super Decathlon 8' span (Japan). Donald Brann, 37785 Amber Dr., Farmington Hills, MI 48331; (810) 553-6711 Eve., (810) 543-1950 day. [3/95]

BUYING SPARK IGNITION model airplane motors; old, gas-powered, model race cars (no plastic). Toy, metal, outboard boat motors: Gale, Oliver, Sea-Fury Twin, etc., tin and cast-iron toys. Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [3/95]

WANTED: To buy 12-inch G.I. Joe's. Have R/C for trade, or will buy them. Jeff Gilbert, 423 S. Randolph St., Princeton, IL 61356-1960; (815) 875-1653. [5/95]

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [2/97]

NEW ZEALAND AERO PRODUCTS—Scale plans: Pawnee Brave, Pawnee, Airtruk/Skyfarmer, Agwagon, Fletcher FU-24, Cessna Aerobat, DC-3/C-47, Typhoon, Hall's Springfield Bulldog, Fairchild PT-19/Fleet PT-26, Rearwin Sportster and more. Fiberglass parts, hardware paks, color photo paks available. Free documentation with plans. Catalogue/price list: $5 (U.S.); Visa/MC. 34 Ward Parade, Stirling Point, Bluff, New Zealand. Phone/24 hr. fax—0064-03-212-8192. [2/96]

FOR SALE: Der Jagger RTF ($1,900); Der Jagger RTF ($1,450); Fly Baby RTF ($900); Fly Baby Folding Wings RTF ($1,840); 1/5-Scale P51 all Servos, Retracts ($1,500); 1/4 Scale P51 all Servos, Retracts ($2,900), F-15 RTF Byron OS91 Dynamax Fans ($2,600); F-14 RTF ($3,500); 12-foot Telemaster RTF ($1,200); Curtis Falcon RTF ($1,800); 1/5-Scale Spitfire RTF ($1,600); PT19 RTF ($1,800); Stinger Kit ($120); Stinger Kit ($120); Bleriot Full Scale ($2,200); D-18 RTF Full Scale all options ($700); Phantom Jet OS91's Dynamax Fans PCM Radio ($3,350). Call after 5:00 Mon-Fri, all day Sat, Sun.; (609) 871-7559. [6/95]

WANTED: Gas-powered model race cars, (no plastic). Also tin and cast-iron toy motorcycles, old toy trains, pre-1950 comic books, toy metal outboard boat motors: Gale, Oliver, Mercury, old tin toys, Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686. (616) 941-2111. [3/95]

WANTED: Futaba Single-Stick Radio PCM Helicopter System—whole system or transmitter only. Bob Vomero; (814) 825-8404. [3/95]

NASA-STYLE MODEL DESIGN—Analyze and display your model showing flight pressures in changing colors. Computes integrated lift, drag, power, info pack w/ demo disk—$10. Synergium, Dept. M, P.O. Box 21481, Tampa, FL 33622. [5/95]

ENGINES, KITS & ACCESSORIES: 35-year collection for sale. For listing send #10 SSAE to: Ed Hagerlin, Box 1980, Overton, NV 89040. [5/95]

SIG SPACEWALKER 1/3-scale, red/yellow, Supertiger 3000, Futaba 8S GAP w/2 receivers, gold stickered, $1175.00. Greg Liskey, Rt. 4, Box 188C, Elkton, VA 22827; (703) 289-9633. [4/95]

WANT TO BUY: Old Cox, Wen-Mac, etc. Dealer catalogues, brochures, or signs. Thanks. Dean Barham, 4032 Iowa St., San Diego, CA 92104; (619) 528-1680. [5/95]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952; "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C. Canada V0R 1L1. [3/95, 5/95]

TURBINE-POWERED F-16 Falcon, original AMA testbed with new engine, Futaba radio, proportional brakes, all white with red and black trim. Ready to fly. Please, serious inquiries only. Bob Fiorenze, (407) 327-6353. [4/95]

AERO FX BY JO DESIGNS—exact-scale, computer-cut, high-performance vinyl graphics and paint masks. Lettering; nose art; insignia for scale; pattern, pylon and sport fliers; complete graphic sets available. Call or write for free sample and catalogue. JO Designs, Rt. 1, Box 225 AA, Stratford, OK 74872; (405) 759-3333; fax (405) 759-3340. [5/95]

HOBBY SHOP BUSINESS FOR SALE. Excellent opportunity. Inventory and equipment included. R/C cars, airplanes, trains, models, rockets, etc. Call Connie Johnson, (800) 255-1917. [4/95]

ADVERTISER INDEX

FINAL APPROACH

JOIN THE FUN, SHARPEN YOUR SKILLS

"Glides like a butterfly; flies like a bumblebee" might well describe the unmatched capabilities of competition fun-fly airplanes. In case you haven't flown one, they are surprisingly versatile, incredibly agile R/C airplanes designed for very low-altitude aerobatics. Competitors fly specialized maneuvers, against the clock, usually consisting of combinations of loops, rolls and touchdowns. Though this kind of competition gets the heart racing and is a gas to watch, that's not the whole story. One of the best-kept secrets is that competition fun-fly aircraft serve extraordinarily well as intermediate trainers.

Kevin Siemonsen holds his Smith Special, which will be reviewed in an upcoming issue. As well as being specialized competition designs, these planes have tremendous potential as intermediate trainers.

Imagine going to the flying field, setting up your fun-fly ship for docile flight and, with your .32-size engine only purring, flying the airplane around at a speed that's somewhere between a walk and a run. Is there a fairly steady 5 to 8mph breeze? Take the ship into the wind, increase the angle of attack, throttle up slightly, and see how easy it is to hover the airplane. Chances are, no trainer on your field could come even close to the slow speed of one of these very lightly wing-loaded craft at low throttle. If your landing skills could use refinement, practice landing approaches in slow motion, and then slowly increase the speed of the action.

The Smith Special, designed by national competition fun-fly champion Jerry L. Smith and manufactured by Air Flair, is shown in flight. Note the elegant engineering that optimizes maneuverability.

Want to try your hand at the fun-fly airplane version of a torque roll? Take the plane up a few hundred feet (given the agility of this design, this is a lot more than "two mistakes high"), and hang it on its prop. This is no problem given the ship's lightness and the low-pitch prop (typically a 10x4). Now it's up to your thumbs.

Did you build in rudder control? Those avoiding every last ounce for the sake of competitiveness eschew such luxuries, but if you're a sport flier like me, you'll add a rudder servo for yaw control. Practicing control inputs in all three axes while that airplane is suspended above the field, nose pointed at the sky, is just plain fun. Here's one of the best opportunities you'll ever have to sharpen eye/hand coordination, and it will show when you fly your other airplanes.

Note the lightweight landing gear.

No airplane yet available can perform rolls, loops (and combinations of them) faster than an up-to-date competition fun-fly design, and only pre-built ARFs, or the more recently popular ARCs (almost ready to cover) aircraft stand a chance of being built more quickly. Building is simplified because there are so few parts. Count the ribs of the Air Flair* Smith Special shown in the photograph.

As for maneuvering speed, consider these winning times performed at the 1994 National Competition Fun Fly Association (NCFFA) Nats. The clock starts at the moment the airplane begins to roll forward, and it stops at the moment of touchdown. Tom Dobbs flew 10 inside loops—between these benchmarks—in only 10 seconds. Jerry L. Smith—designer of the Smith Special shown on this page and overall competition fun-fly champ this year—flew 10 horizontal touch-and-go's (there's a required 180-degree turn after each touch) in 24.16 seconds. A "roop" is a takeoff, roll, loop and touchdown. Jerry flew five roop touch-and-go's, i.e., touching the ground between each roop, in only 16.1 seconds.

The Modified Dixie Death entails a takeoff, three loops, three rolls and a touchdown. Steve Luchaco performed a Double Modified Dixie Death (two sets with a touchdown between) in only 12.8 seconds. Try approaching these times with your most agile sport fun-fly plane!

Competition fun-fly aircraft embody structural innovation and reflect judicious, elegant use of composites. They are easy to build and relatively inexpensive. They are excellent intermediate trainers (their lightness also makes them more crash-resistant than most) and offer huge potential for fun. If you are a newcomer and you want to get involved in the competitive side of things, the NCFFA notes that a new "manufacturer's class" has opened up for stock kits (minimum weight 3 pounds; 4-channel radio). For more information on the new class, contact the NCFFA at 9 Jervey Rd., Greenville, SC 29609 (you can join for only $10 a year). But even if you intend never to compete, don't overlook the tremendous flying experience these unique models can provide.

—Tom Atwood

**Addresses are listed alphabetically in the Index of Manufacturers on page 161.* ■